

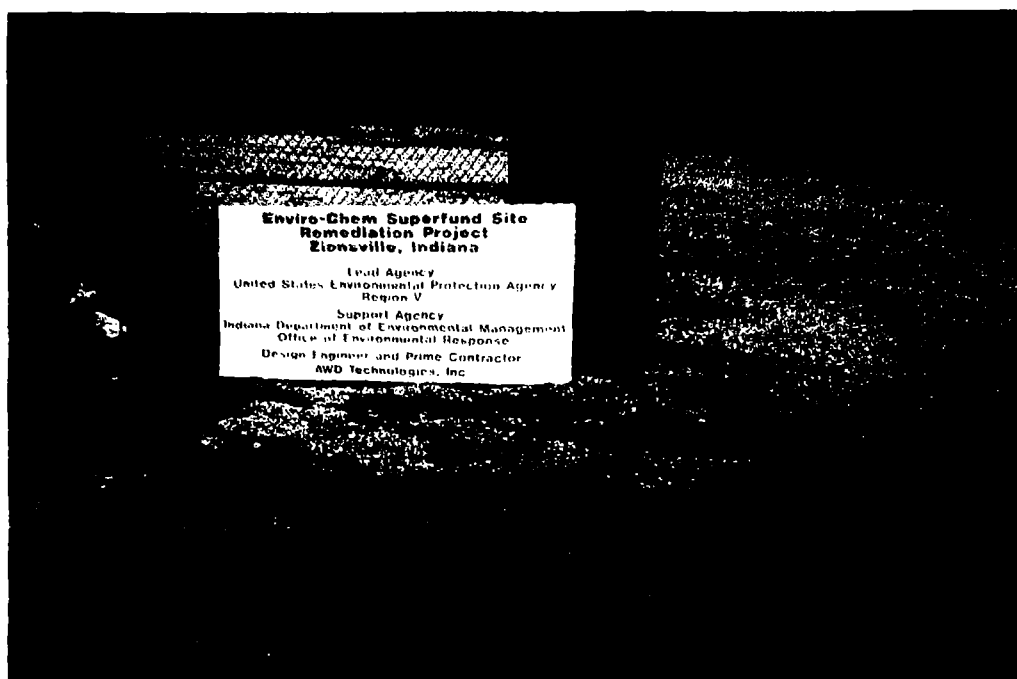
*Submittal to USEPA & IDEM*

EPA Region 5 Records Ctr.



256709

***100 % SVE DESIGN FOR THE RRA AT THE  
ENVIRO-CHEM SUPERFUND SITE  
ZIONSVILLE, INDIANA***



Submitted by:

***Versar*** INC.

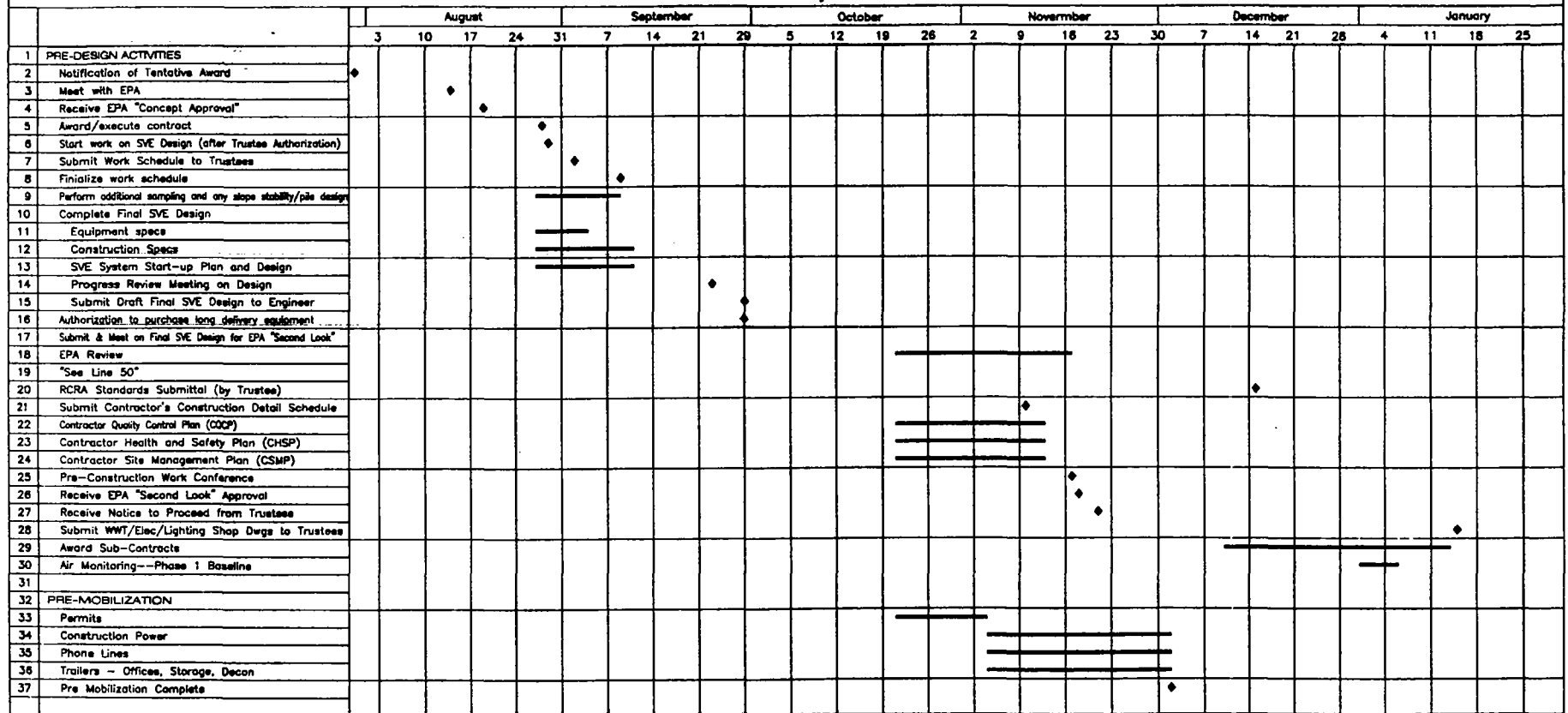
1900 FROST ROAD, SUITE 110  
BRISTOL, PENNSYLVANIA 19007  
215-788-7844

In Association With:



*21 October 1997*

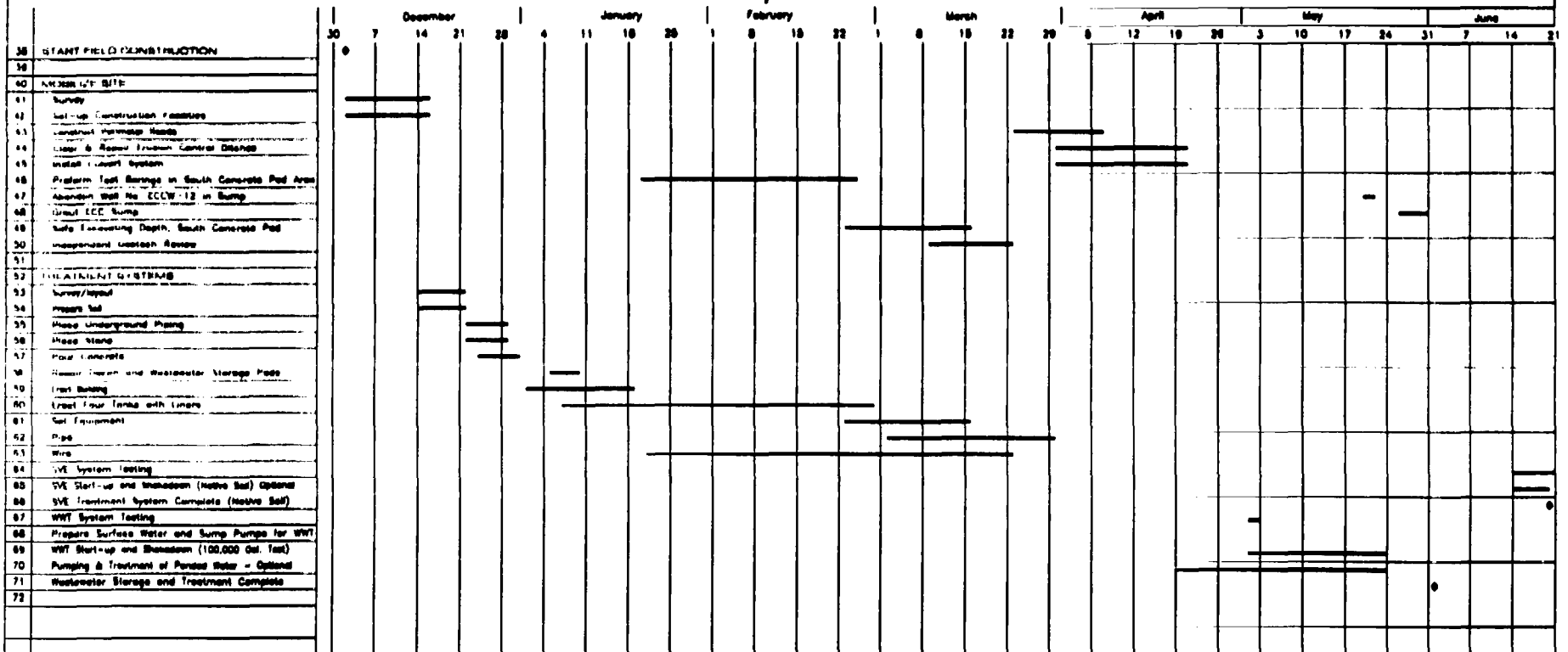
Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana  
Contract RRA Project Schedule



Date: 06/01/98

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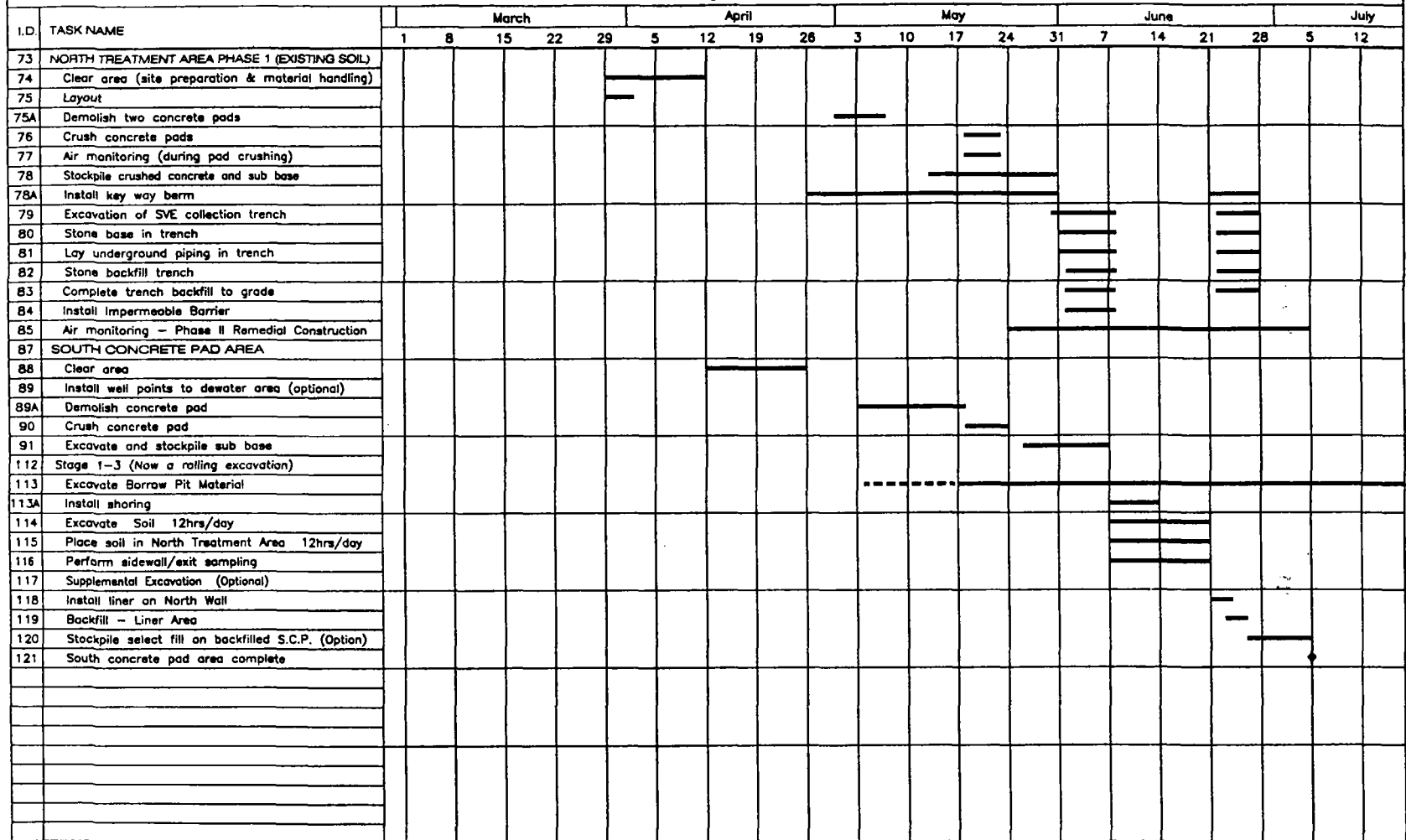
Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana  
Contract RRA Project Schedule



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Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana  
Contract RRA Project Schedule

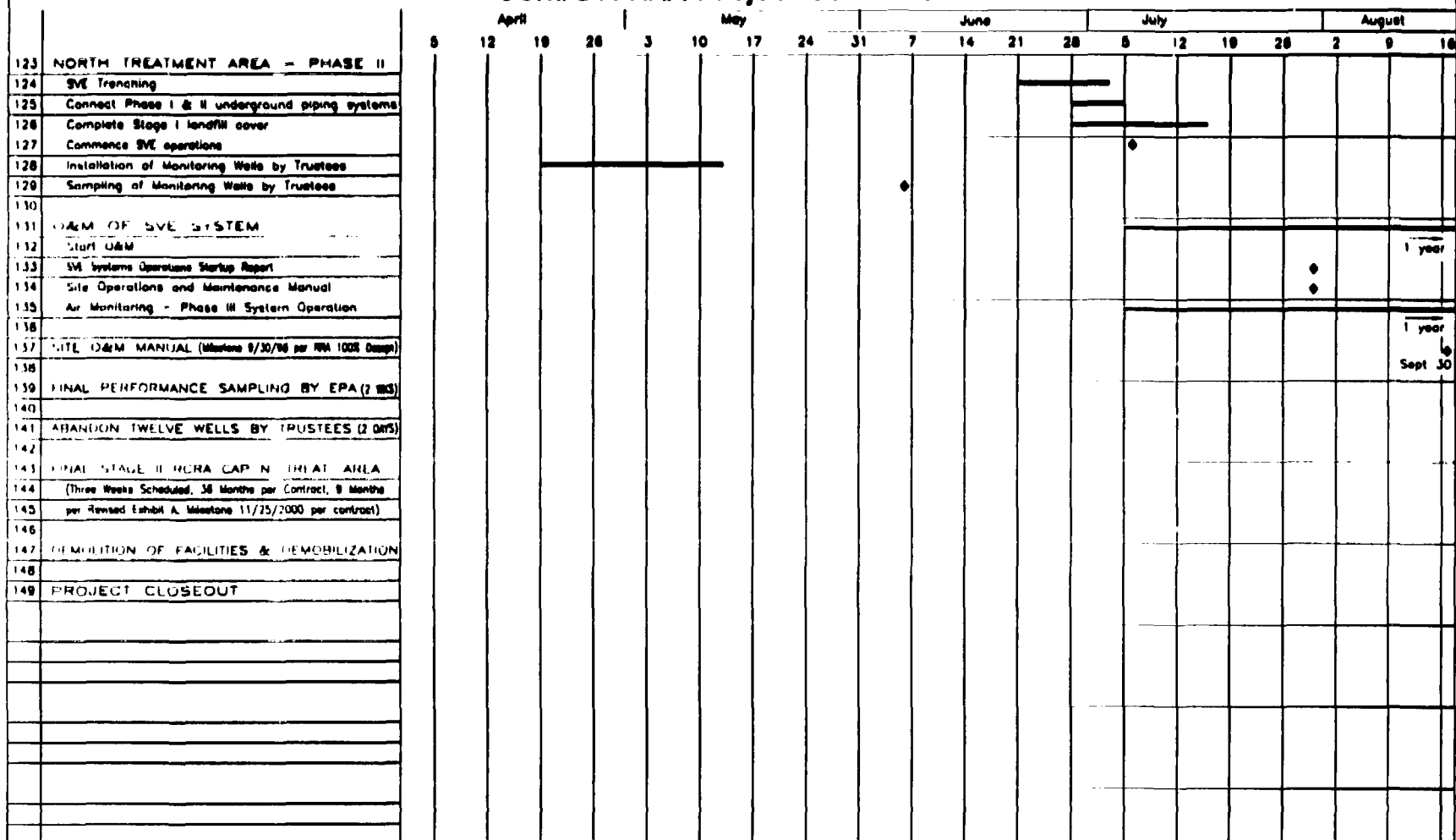


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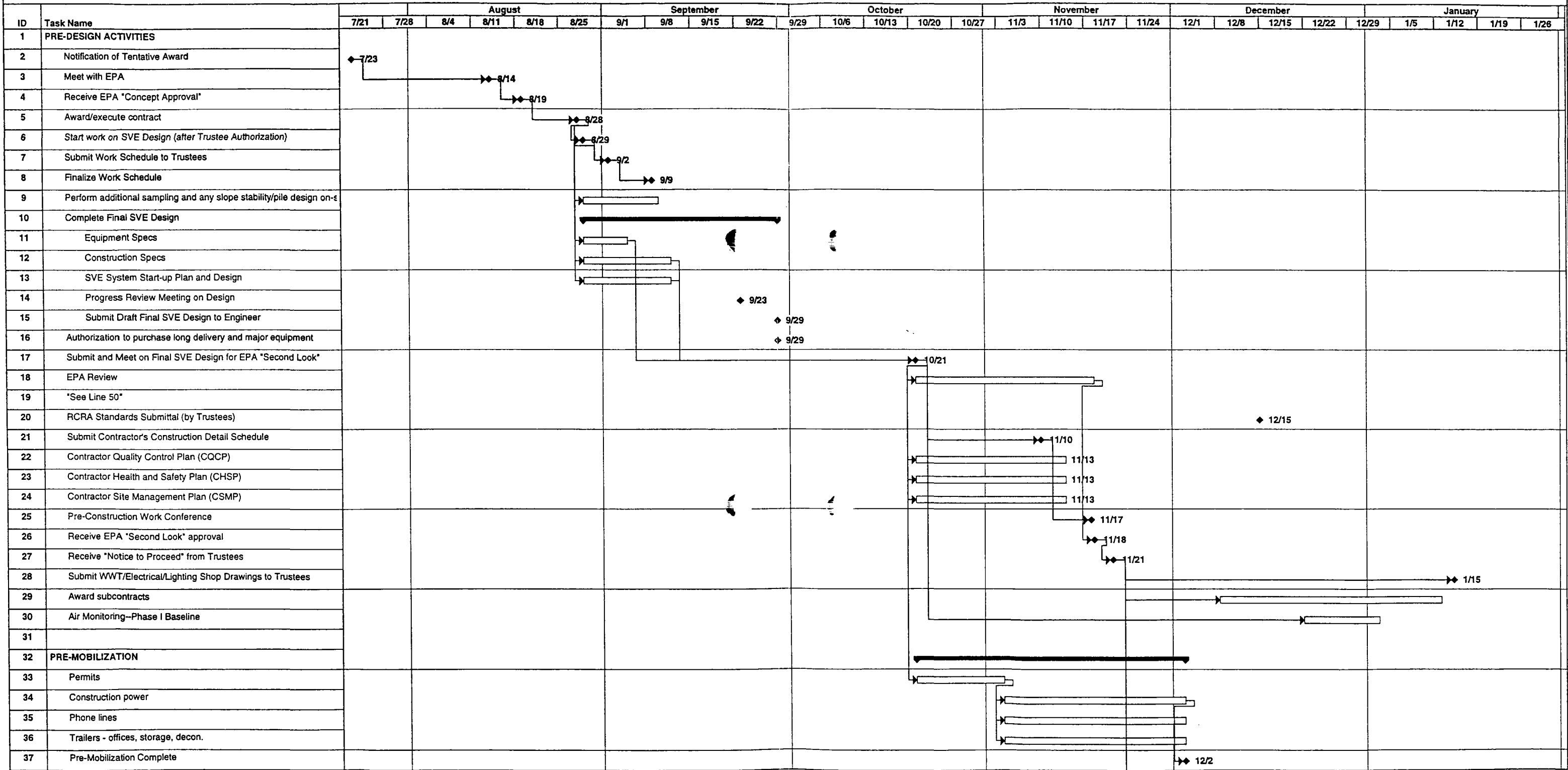
**Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana  
Contract RRA Project Schedule**



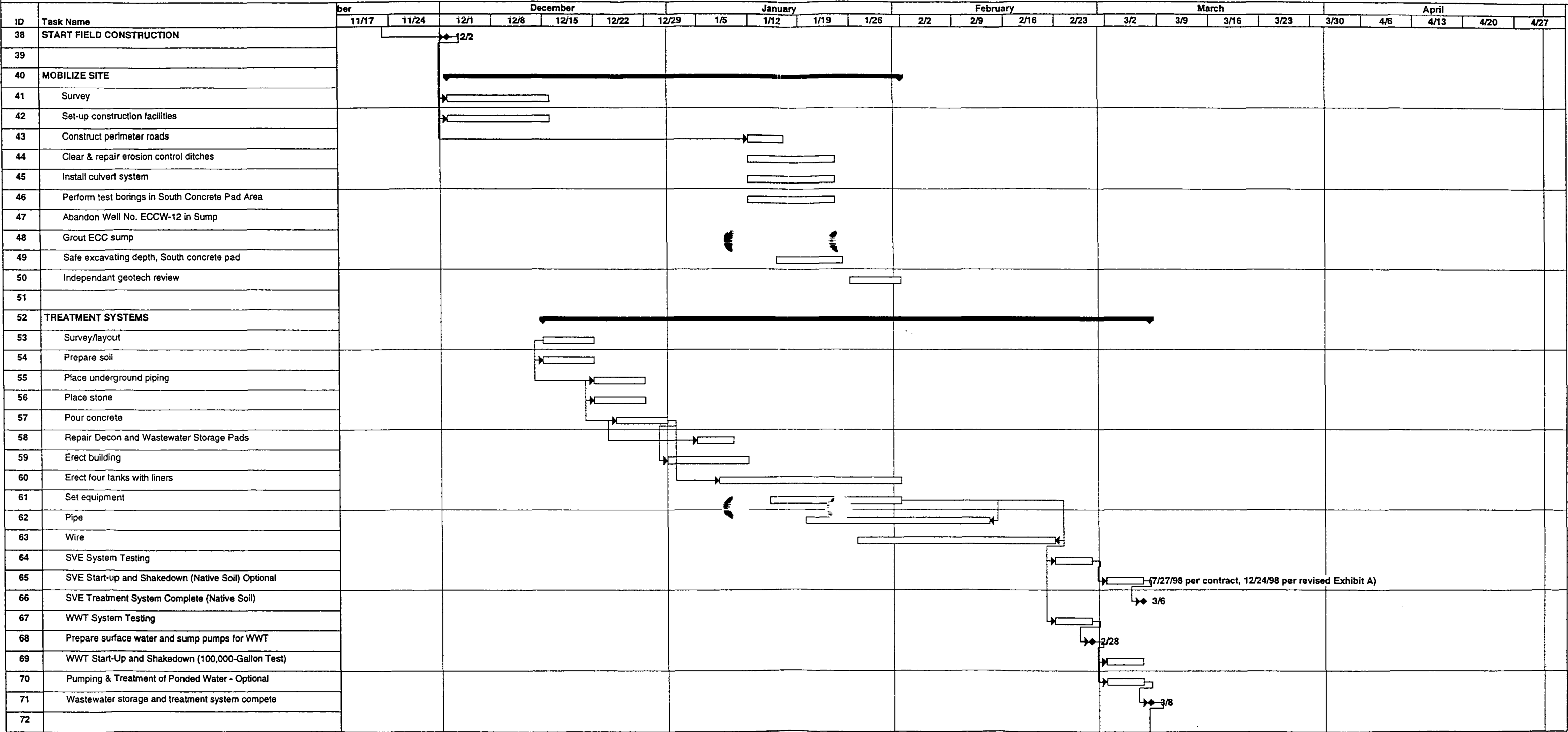
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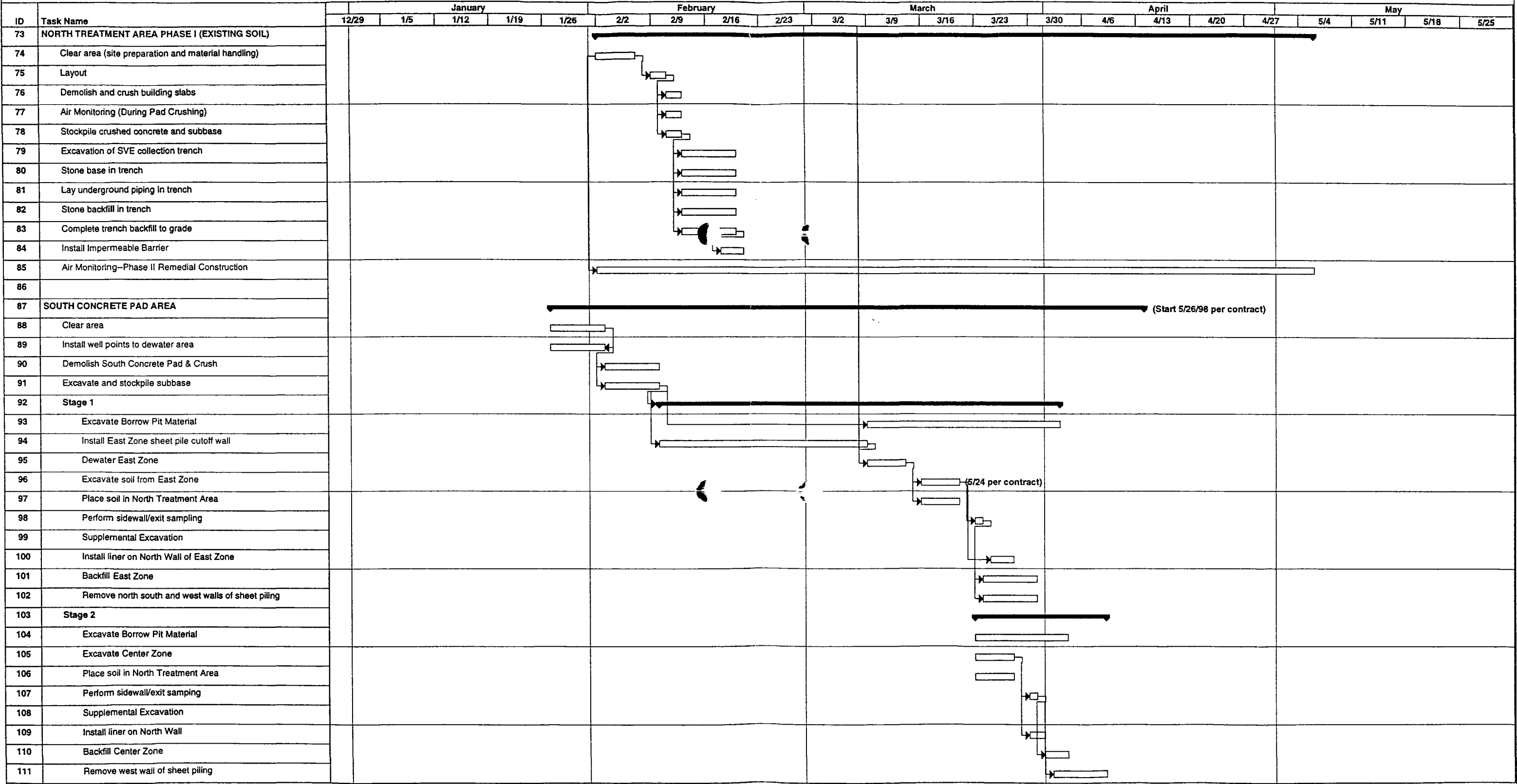
Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana  
Contract RRA Project Schedule



# Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana Contract RRA Project Schedule

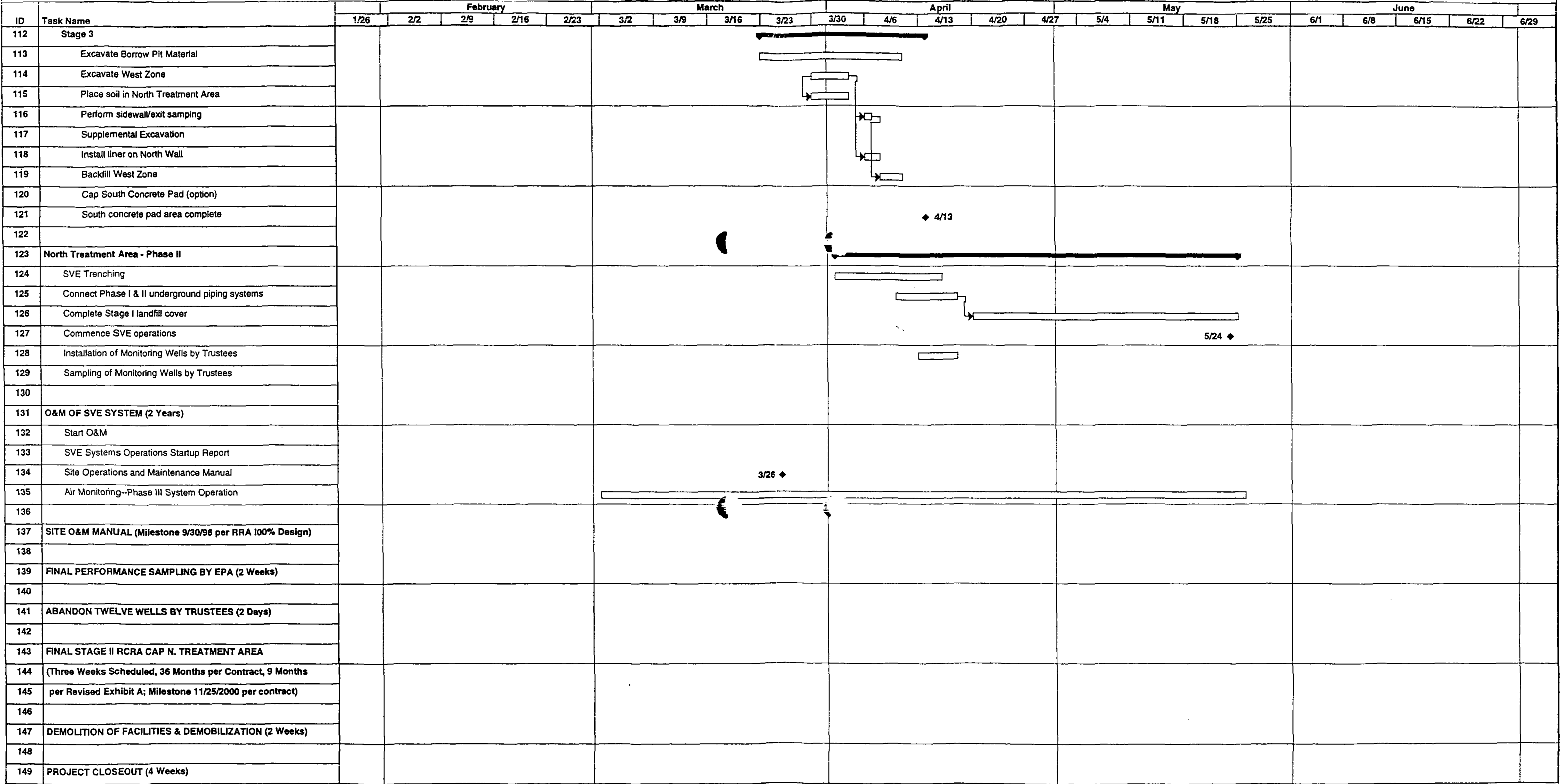


# Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana Contract RRA Project Schedule





# Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana Contract RRA Project Schedule



**1**

Drawing List

**2**

Specification List

**3**

Specifications

**4**

Schedule

**5**



<b>Enviro-Chem Project Drawing List--100% SVE Design</b>		
	<b>Versar Dwg. No.</b>	<b>Radian Dwg. No.</b>
Cover Sheet	3709-000	----
General Site Location	----	G-1
Site General Arrangement & Safety Plan	----	G-2
Northern & Central Areas, Phase 1 SVE Trenches ( Native Soil )	3709-101	----
Norther, Central Area, SVE Trenches, Dewatering Piping	3709-102	----
Northern Area, Phase 2 SVE Trenches ( Backfilled Soil )	3709-103	----
Process Area-General Arrangement	3709-201	----
Process Area - SVE Piping Elevations	3709-202	----
W.W. Storage Tank-Details	3709-204	C-15
Process Bldg - Foundation & Slab	3709-205	----
Process Bldg - Architectural & Details	3709-206	----
Process Bldg -Equipment Arrangement	3709-207	----
Process Bldg- Piping & Mechanical	3709-208	----
Process Bldg - HVAC & Electric Panels	3709-210	----
W.W. Treatment System, Portable	3709-211	----
SVE P & I D	3709-301	----
WWT P & I D	3709-302	----
Electrical Single Line Diagram	3709-401	----
Electrical Schematics / Instrumentation	3709-402	----
Electrical Schematic / Instrumentation	3709-403	----
Electrical Schematic / Instrumentation	3709-404	----

<b>Radian 100 % RRA Design June 1997 Drawing List</b>		
Drawings Revised by Versar October 21, 1997		
	<b>Versar Dwg. No.</b>	<b>Radian Dwg. No.</b>
Special Construction & Grading Plan	----	C - 2
Concrete Pad & Foundation Removal Plan	----	C - 3
Contaminated Material Excavation & Placement Plan	----	C - 4
Stage 1 - Select Soil Cover Plan	----	C - 5
Stage 1 - Final Cover Plan	----	C - 6
Stage 2 - Final Cover & Drainage Plan	----	C - 7
General Process & Instrumentation Diagram	----	I - 1

## **Radian 100 % RRA Design, June 1997**

Drawings Eliminated by Versar Design

	<b>Versar Dwg. No.</b>	<b>Radian Dwg. No.</b>
Wastewater Storage & Transfer System Details	-----	C - 14
Water Treatment Building Plan	-----	S - 1
Wastewater Transfer Building Plan	-----	S - 2
Wastewater Transfer Pumps & Piping	-----	M - 1
Wastewater Treatment, Mechanical Plan	-----	M - 2
Wastewater Treatment, Mechanical Detail	-----	M - 3
Wastewater Treatment, Mechanical Detail	-----	M - 4
Wastewater Treatment, P & I Diagram	-----	I - 2
Electrical Drawings	-----	E-0 thru E-11



<b>Enviro-Chem Project Specification List</b> <b>100 % SVE Design</b>	
	<b>Versar Spec No.</b>
Subcontractor Submittals	01301
PVC Piping & Fittings	02661
CPVC Piping & Fittings	02662
Non-Metallic Valves	02663
Pre-Engineered Building	13121
S.V.E. System	15000
Granular Activated Carbon	15200
Pressure Testing of Piping	15980

<b>Enviro-Chem Project Specification List</b> <b>100 % WWT Design</b>	
	<b>Versar Spec. No.</b>
Wastewater Treatment System	13110.r4

Note: These specifications are in addition to the relevant Radian specifications in their 100 % design.





## SECTION 01301: SUBCONTRACTOR SUBMITTALS

### 1.0 GENERAL

#### 1.01 SUMMARY

- A. Submittals - Subcontractor (hereafter "Contractor") shall provide all submittals required by the specifications in accordance with the requirements herein.
- B. Drawings Approval Schedule - Submit drawings to Versar sufficiently in advance (i.e., minimum of two weeks) in accordance with the prearranged schedule to cause no delay in Versar's own work or in that of any other subcontractor and to afford ample time for considerations, checking, correcting and rechecking. Show complete details of construction and methods of installation including sizes, dimensions, setting numbers, types of materials, provision of hardware, accessory items, build-ins, opening sizes, cut-outs, joints, required blocking, welds, anchorage to other construction, and other pertinent items. Verify dimensions on the job and coordinate work with adjoining work.
- C. Drawing Size - All shop drawings must be submitted on 24" x 36", 11" x 17" or 8 1/2" x 11" size sheets.
- D. Number of Drawings - Six copies of shop drawings descriptive literatures, cut sheets, specs, O&M instruction and spare parts list will be required for Versar's use unless otherwise indicated.
- E. Shop Drawings Revision - Versar will return to the Contractor one red-line copy of any shop drawing which has been rejected or returned for revisions. Contractor will make additional submittals, as required prior to the start of any field or shop work. Versar's approval of such drawings or schedules will not relieve contractor from responsibility for any resulting unapproved deviations from the drawings and specifications.
- F. Drawing Distribution - No shop drawings will be distributed for field use without appropriate Versar approval.

#### 1.02 OTHER TYPES OF SUBMITTALS

- A. Construction Sequence Plan: In accordance with Contractor's scope of work and stated in applicable specification sections.

- B. Material Delivery Tickets or Bills of Lading: including all imported backfill materials, piping materials, and appurtenances, equipment electrical system materials, concrete, steel and all other construction materials.**
- C. Certification and Test Results for all construction materials requiring certification and/or test results as set forth in these specifications must be made prior to invoicing.**
- D. Manufacturer's Instructions, Certificates, and O&M requirements for all equipment or materials should be submitted for Versar at the time they are delivered to the site, if not previously submitted under paragraph 1.01D.**

**-END OF SECTION-**

## SECTION 02661: PVC PIPING AND FITTINGS

### 1.0 GENERAL

#### 1.01 SECTION INCLUDES

- A. Requirements for Furnishing and Placement of PVC Piping and Fittings - this section includes the requirements for furnishing and placement of PVC piping and fittings. Work includes all piping, valves, fittings, supports, appurtenant structures, components and installation of the PVC piping system.
- B. Pressure Testing - pressure testing of installed PVC for leaks and/or other deficiencies that may have occurred during their installation.

#### 1.02 REFERENCES

- A. The standards listed below have been included in this specification to the extent referenced. The standards are referred to in the text by basic designation only. Use the latest revision date available unless otherwise indicated.
- B. American Society for Testing Materials (ASTM)
  - 1. ASTM D 1785 - Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe Schedules 40, 80 and 120.
  - 2. ASTM D 2466 - Standard Specifications for Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.
- C. Where reference is made to one of the above standards, the revision in effect at the time of the subcontract will apply.

#### 1.03 DELIVERY, STORAGE AND HANDLING

- A. Protection - All parts and materials will be properly protected so that no damage, deterioration, or contamination occurs from the time of shipment until installation has been completed.
- B. Replacement of Damaged Parts and Materials - If, in the opinion of Versar or Engineer, parts and materials are damaged, deteriorated, or contaminated before acceptance of the completed works, the material and/or the works will be rejected. The Contractor will replace the labor, parts and materials at no additional cost promptly (no longer than five days). The term Engineer, shall mean the Engineer

designated by the Trustees pursuant to Versar's Contract with the Trustees.

- C. **Material Storage** - Materials will be stored in only the designated lay-down area and in such a manner to ensure preservation of their quality and fitness for use. Whenever deemed necessary by Versar or Engineer, materials will be placed on wooden platforms or other hard, clean surfaces and not on the ground. Stored materials will be stored in such a manner to facilitate prompt inspections by Versar or Engineer.

#### **1.04 CONDITIONS AND HAZARDS AT THE SITE**

- A. **The Contractor must take necessary precautions to prevent damage to any above-or-below-ground existing structures. Notify Versar and Engineer of any damaged underground structures and make repairs or replace at no cost before backfilling.**

#### **2.0 PRODUCTS**

##### **2.01 MATERIALS**

- A. **Piping and Fittings** - Pipe and fittings will be manufactured from a PVC compound which meets the requirements of Cell Classification 12454-B polyvinyl chloride as outlined in ASTM D-1784 and D-1785. The PVC color will be approved by Versar. Pipe and fitting materials will be specifically formulated with UV screens to provide for long term exposure with no deleterious effects, if exposed to sunlight.
- B. **Portable Water System** - If a piping system is to be constructed to convey potable water, materials from which pipe and fitting are manufactured will have been tested and listed for conveying potable water by the National Sanitation Foundation or other approved sources.

##### **2.02 DIMENSIONS AND DESIGN REQUIREMENTS**

- A. **Component Details** - Fitting Components that utilize socket type solvent welded connections will have socket diameters, lengths, and wall thicknesses as required by ASTM D-2467 or D-2466. Components utilizing taper pipe thread connections will have thread lengths, diameters and configurations in conformance with ASTM D-2464.
- B. **Fitting Style** - Fittings will be industrial heavy duty hub style fittings.
- C. **Flanges** - Flanges will be one piece solid design or two part vanstone type which utilize the tapered, serrated face and full face gasket technique for joining and are

compatible with ANSI B 16.5 Class 150 metal flanges.

- D. Unions - Unions will be O-ring seal type having interchangeable components with true union valves for maximum system versatility.
- E. Piping - Piping will be in conformance with ASTM D-1785 for pressure rated piping system as designated for Schedule 40, 80 and 120, Class 150 PVC piping.

## 2.03 PRESSURE RATINGS

- A. Socket Fittings - Socket fittings will be pressure rated the same as the corresponding pipe size prescribed by ASTM D-1785 for Schedule 40, Class 150 piping. Threaded fittings will be pressure rated at 50 percent of the rating for socket fittings.
- B. Valves, Unions and Flanges - Valves, unions and flanges will be pressure rated at 150 psi for water service at 73 degrees Fahrenheit, non-shock, and will have a minimum burst strength of 3.3 times the rated pressure.
- C. Piping - Piping will be pressure rated as prescribed in ASTM D-1785.

## 2.04 MARKINGS

- A. Fittings and pipe will be clearly marked with the manufacturer's name or trade mark, material, ASTM designation number or alternative symbol indicating compliance with alternate standards, NSF seal of approval indicating compliance with NSF Standard 14 for the conveyance of potable water, and indicating compliance with the applicable ASTM Standard and the country of manufacture.

## 3.0 EXECUTION

### 3.01 GENERAL INSTALLATION

- A. Installation - Install piping and fittings in accordance with the Plan Drawings and Details. Install to the alignment and elevations shown on the plan drawings.
- B. Pressure Testing - Pressure test all closed lines in accordance with Section 15980.
- C. PVC Piping Exposed to Sunlight - All PVC piping exposed to ultraviolet radiation (sunlight) will be lightly sanded and painted red. Acceptable paint types and schedules will be as listed below, applied at the dry film thickness (DFT) in mils per coat noted.

**1. Tnemec**

**1 Coat: 66-Color Hi-bound Expoxoline (4 DFT)**  
**2 Coats: 71-Color Endura Shield (2.5 DFT per coat)**

**2. Koppers**

**1 Coat: Higard Epoxy (4 DFT)**  
**1 Coat: 1122 BRS Linear Polyurethane (2.5 DFT)**

**3. Porter**

**1 Coat: M.C.R. 43 Hibuild Primer 4336 (5 DFT)**  
**2 Coats: Hythane 4600 Series Polyurethane (2.0 DFT per coat)**

**- END OF SECTION-**

## SECTION 02662: CPVC PIPING AND FITTINGS

### 1.0 GENERAL

#### 1.01 SECTION INCLUDES

- A. Requirements for Furnishing and Placement of CPVC Piping and Fittings - This section includes the requirements for furnishing and placement of CPVC piping and fittings. Work includes all piping, valves, fittings, supports, appurtenant structures, components and installation of the CPVC piping system.
- B. Pressure Testing - Pressure testing of installed CPVC for leaks and/or other deficiencies that may have occurred during their installation.

#### 1.02 REFERENCES

- A. The standards listed below have been included in this specification to the extent referenced. The publications are referred to in the text by basic designation only. Use the latest revision date available unless otherwise indicated.
- B. American Society for Testing Materials (ASTM)
  - 1. ASTM D 1784 - Standard Specification for Chlorinated Polyvinyl Chloride (CPVC) Plastic Pipe Schedules 40, 80 and 120.
  - 2. ASTM F437 - Standard Specifications for Chlorinated Polyvinyl Chloride (CPVC) Plastic Pipe Fittings, Schedules 40, 80 and 120.
- C. Where reference is made to one of the above standards, the revision in effect at the time of the contract will apply.

#### 1.03 DELIVERY, STORAGE AND HANDLING

- A. Protection - All parts and materials will be properly protected so that no damage, deterioration, or contamination occurs from the time of shipment until installation has been completed.
- B. Replacement of Damaged Parts and Materials - If, in the opinion of Versar or Engineer, parts and materials are damaged, deteriorated, or contaminated before acceptance of the completed works, the material and/or the works will be rejected. The Contractor will replace the labor, parts and materials at no additional cost promptly (within five days).

- C. **Materials Storage** - Materials will be stored in only the designated lay-down area and in such a manner as to ensure preservation of their quality and fitness for use. Whenever deemed necessary by Versar or Engineer, materials will be placed on wooded platforms or other hard, clean surfaces and not on the ground. Stored materials will be stored in such a manner to facilitate prompt inspections by Versar or Engineer.

#### **1.04 CONDITIONS AND HAZARDS AT THE SITE**

- A. **The Contractor must take necessary precautions to prevent damage to any above-or-below-ground existing structures.** Notify Versar and Engineer of any damaged underground structures and make repairs or replace at no cost to the Versar before backfilling.

#### **2.0 PRODUCTS**

##### **2.01 MATERIALS**

- A. **Piping and Fittings** - Pipe and fittings will be manufactured from a CPVC compound which meets the requirements of Cell Classification 12454-B chlorinated polyvinyl chloride as outlined in ASTM D-1784 and D-1785. The CPVC color will be approved by Versar. Pipe and fitting materials will be specifically formulated with UV screens to provide for long term exposure with no deleterious effects, if used outdoors.
- B. **Potable Water System** - If piping system is to be constructed to convey potable water, materials from which pipe and fitting are manufactured will have been tested and listed for conveying potable water by the National Sanitation Foundation or other approved sources.

##### **2.02 DIMENSIONS AND DESIGN REQUIREMENTS**

- A. **Components Detail - Fitting Components** that utilize socket type solvent welded connections will have socket diameters, lengths, and wall thicknesses as required by ASTM F441, F437 or F439. Components utilizing taper pipe thread connections will have thread lengths, diameters and configurations in conformance with ASTM D-2464.
- B. **Fittings Style** - Fittings will be industrial heavy duty hub style fittings.
- C. **Flanges** - Flanges will be one piece solid design or two part vanstone type which utilize the tapered, serrated face and full face gasket technique for joining and are compatible with ANSI B 16.5 Class 150 metal flanges.



- D. Unions - Unions will be O-ring seal type having interchangeable components with true union valves for maximum system versatility.
- E. Piping - Piping will be in conformance with ASTM D-1785 for pressure rated piping system as designated for Schedule 40, 80 and 120, Class 150 CPVC piping.

## 2.03 PRESSURE RATINGS

- A. Socket Fittings - Socket fittings will be pressure rated the same as the corresponding pipe size prescribed by ASTM D-1785 for Schedule 40, Class 150 piping. Threaded fittings will be pressure rated at 50 percent of the rating for socket fittings.
- B. Valves, Unions and Flanges - Valves, unions and flanges will be pressure rated at 150 psi for water service at 73 degrees Fahrenheit, non-shock, and will have a minimum burst strength of 3.3 times the rated pressure.
- C. Piping - Piping will be pressure rated as prescribed in ASTM D-1785.

## 2.04 MARKINGS

- A. Fittings and pipe will be clearly marked with the manufacturer's name or trade mark, material, ASTM designation number or alternative symbol indicating compliance with alternate standards, NSF seal of approval indicating compliance with NSF Standard 14 for the conveyance of potable water, and indicating compliance with the applicable ASTM Standard and the country of manufacture.

## 3.0 EXECUTION

### 3.01 GENERAL INSTALLATION

- A. Installation - Install piping and fittings in accordance with the Plan Drawings and Details. Install to the alignment and elevations shown on the plan drawings.
- B. Pressure Testing - Pressure test all closed lines in accordance with Section 15980.
- C. CPVC Piping Exposed to Sunlight - All CPVC piping exposed to ultraviolet radiation (sunlight) will be lightly sanded and painted red. Acceptable paint types and schedules will be as listed below, applied at the dry film thickness (DFT) in mils per coat noted.

1. **Tnemec**

1 Coat: 66-Color Hi-bound Expoxoline (4 DFT)

2 Coats: 71-Color Endura Shield (2.5 DFT per coat)

2. **Koppers**

1 Coat: Higard Epoxy (4 DFT)

1 Coat: 1122 BRS Linear Polyurethane (2.5 DFT)

3. **Porter**

1 Coat: M.C.R. 43 Hibuild Primer 4336 (5 DFT)

2 Coats: Hythane 4600 Series Polyurethane (2.0 DFT per coat)

- END OF SECTION-

## SECTION 02663: NON-METALLIC VALVES: PVC, CPVC, PP and PVDF

### 1.0 GENERAL

#### 1.01 SUMMARY

##### A. Section includes:

1. Maximum Service Temperature - This specification covers the manufacturing requirements PVC, CPVC, Polypropylene and PVDF valves intended for use in industrial, commercial and residential pressure piping systems where cost effective resistance to corrosion is of prime importance. Maximum service temperatures are: PVC, 140°F; CPVC, 210°F; PP, 180°F; PVDF, 280°F.
2. Valve Installation - Installation of valves as shown on the Drawings including all connections, supports and testing.
3. Submittal Requirements - Submittal of technical specifications, data sheets, O&M manuals and spare parts lists in accordance with Section 01301.

#### 1.02 RELATED SECTIONS

- A. Section 02661 - PVC Piping
- B. Section 02662 - CPVC Piping

### 2.0 PRODUCTS

#### 2.01 MATERIALS

- A. Dimensions/Valve Design: PVC and CPVC socket connections will conform to the requirements of ASTM D-2466 and F-438 for Schedule 40 pressure fittings. PP and PVDF socket connections will be fusion type as described in ASTM D-2567 Technique 1. All threaded connectors will conform to the requirements of ASTM D-2466 and F438 as well as ANSI B1.20.1 for tapered pipe threads. The valve design will be full port (6 inch size is standard port) with full flow around the rib-guided ball. Foot valve models will have a minimum cumulative area ratio of screen holes (inlet) to valve port of 3:1. The valve seat will be an elastomer

which will permit low seating head, and a flow directional arrow will be molded on the valve body for permanent visibility. The end connections must be of the True Union type, and all PVC and CPVC valves will be supplied with both socket and threaded connectors for universal installation (1/2 inch - 2 inch only).

- C. **Markings:** Valves will be clearly marked with the manufacturer's name or trademark, size, material of construction, country of manufacture. PVC and CPVC valves will additionally bear the National Sanitation Foundation NSF-pw SE seal inferring third party certification that product and materials are regularly tested for ASTM physical compliance and NSF chemical requirements for safe conveyance of potable water, if so used.
- D. **Performance and Pressure Rating:** Valves will be rated for 150 psi service at 73°F water, non-shock and have a minimum burst rating of 3.3 times the rated working pressure for maximum safety.

### **3.0 EXECUTION**

#### **3.01 INSTALLATION**

- A. **Alignments and Elevations** - Install in accordance with the alignment and elevations shown on the drawings.
- B. **Valve Supports** - Support all valves in accordance with manufacturer's recommendations..
- C. **Valve Testing** - Pressure Test valves in-line in accordance with Section 15980 and manufacturer's recommendations.

- END OF SECTION -

## **SECTION 13121: PRE-ENGINEERED METAL BUILDING**

### **1.0 GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Pre-Engineered Building - Furnish all labor, materials, equipment, and incidentals required to fabricate, deliver, and install one complete pre-engineered metal building.
- B. Pre-Engineered Details - Pre-engineered metal building will be furnished and installed complete with wind and wall bracing, purlins, roof and wall panels, interior linings and finishes, building insulation, trim, gutters, down spouts, flashing, metal doors, glazing, louvers, finish hardware, cutouts, caulking, sealants, vent openings, explosion relief panels and accessories as required for a complete and functional building structure, ready for HVAC, process piping, and other interior installations as indicated on Plan Drawings.
- C. Inspections and Permits - Contractor will be responsible for obtaining building inspections and permits, utility locates, and work permits as required.

#### **1.02 RELATED SECTIONS**

- A. Section 03200: Concrete Reinforcement (See Radian Specification)
- B. Section 03300: Cast-In-Place Concrete (See Radian Specifications)
- C. Section 03350: Concrete Finishes (See Radian Specifications)
- D. Section 16010: Electrical (See Radian Specifications)

#### **1.03 SUBMITTALS**

- A. Submit, in accordance with Section 01301, shop drawings and manufacturer's specifications for the pre-engineered metal building, showing full details for building construction. Submit details and catalog information for components, accessories, and fasteners.
- B. Submit foundation reactions at all columns, corners and base channel, identifying applied loads, load factors, and load combinations for the concrete slab on grade foundation system with 6-inch curbs for containment and sump as indicated on the Plan Drawings.

- C. Submit samples of actual finish on representative metal samples in available colors. The color of exterior components (roof, walls, and trim) of the pre-engineered building will be selected by Versar from manufacturer's color code guide. Coordinate other exterior and interior finishes with approved building color and finish.
- D. Submit complete erection drawings and installation instructions, showing anchor bolt and base settings; bracing; and sections and details for openings, covering, and trim.
- E. Erection Plan Drawings: Three sets of reproducible Erection Plan Drawings for the pre-engineered metal building, sealed by a registered Professional Engineer who specializes in Structural Engineering. After review by Versar, provide approved Plan Drawings for construction in accordance with the provisions of Section 01301.

#### **1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, and handle prefabricated components, sheets, panels, doors, and other manufactured items so they will not be damaged or deformed. Stack materials on platforms or pallets and cover with a weather-tight ventilated covering to keep the materials off the ground and away from moisture. Do not store materials in contact with other materials that will cause staining. Contractor will be responsible for replacing material damaged by improper storage and/or transport.
- B. Deliver caulking and sealing compounds to the job in unbroken, sealed containers bearing the manufacturer's mixing directions. Store materials in sealed containers in a dry protected area above the ground or floor. Materials will be stored above 40° F.

#### **1.05 QUALITY ASSURANCE**

- A. The components, fabrication, and erection of the pre-engineered metal building will conform to the latest edition of the following codes and standards:
  - 1. American Iron and Steel Institute (AISI) - Specification for the Design of Cold-Formed Steel Structural Members

2. American Institute of Steel Construction (AISC) - Specification for Structural Steel Buildings; Code of Standard Practice for Steel Buildings and Bridges
3. American Society for Testing and Materials (ASTM) - as applicable
4. International Conference of Building Officials (ICBO) - 1993 Uniform Building Code as accepted by Boone County, Indiana.
5. Metal Building Manufacturer's Association (MBMA) -Low Rise Building Systems Manual
6. Steel Door Institute (SDI) - SDI 100, Recommended Specifications Standard Steel Doors and Frames; SDI 109, Hardware for Standard Steel Doors and Frames

#### 1.06 QUALIFICATIONS

- A. Building components will be provided by a single building manufacturer continuously engaged in providing similar structures for the last 10 years.
- B. Building manufacturer will be Category MB certified by the American Institute of Steel Construction.
- C. Erection of the building and its components will be by a reputable erector having at least five years experience in the construction of such structures; erector will be approved by the building manufacturer.

#### 1.07 PERFORMANCE CRITERIA

- A. Design Loads: in conformance with 1993 UBC, Section 1608 (Snow Loads), Section 1609 (Wind Load), Section 1610 (Seismic Load) and Section 1612 (Special Loads as applicable).
- B. Load combinations will be as specified in the MBMA Metal Building Systems Manual, and as required by the UBC.
- C. Consideration will be given to the effects of unbalanced loading on the structure.
- D. Provide manufacturer's deflection limitations for base channel members and for wall and roof panels. Indicate gauges, shapes, and dimensions of steel members.

- E. Building dimensions on the Plan Drawings represent minimum clearances necessary to accommodate equipment installation, operation, and servicing requirements.**
- F. End wall bracing will be as recommended by building manufacturer, with modifications as necessary to achieve compliance with design load criteria.**
- G. Wall and roof panel steel sheet gauges and factory finish processes will be specifically identified in shop drawing package.**

#### **1.08 DESIGN ANALYSIS AND CALCULATIONS**

- A. Building manufacturer will have on file a complete design analysis with calculations of all prefabricated structural components for a minimum of five years following the date of the purchase order for the building, and will furnish copies to Versar during the five year period, upon request. The analysis will be sealed by a Registered Professional Engineer in Indiana who specializes in Structural Engineering.**

#### **1.09 WARRANTY**

- A. The metal panel coating system will be warranted not to blister, peel, crack, chip, or experience material rust-through for a period of 10 years.**
- B. The metal building system will be warranted not to leak water caused by ordinary wear and tear by the elements for a period of 10 years after final acceptance of the work.**

#### **2.0 PRODUCTS**

##### **2.01 GENERAL**

- A. Pre-engineered building will be as manufactured by Parkline North East, Wilmington, Delaware or Versar approved equivalent. All building accessories as specified herein will be supplied by the building manufacturer, unless otherwise noted.**
- B. Building system will be a steel self framing design utilizing the roof and wall panels as the primary structural support with a gable roof. The clear height inside of the structure at the eaves will be at least 12 feet above finished floor elevation.**



The foundation dimensions will be approximately 32 feet by 46 feet. Any dimensional variations will require Versar's approval and will be coordinated with the placement and sizes of interior equipment and openings.

- C. Roof will be pitched at 2-inches vertical to 12-inches horizontal, or as approved by Versar.
- D. All building components and parts will be clearly marked with erection markings, that correspond to the Erection Plan Drawings.
- E. Field modification of any components or parts will require prior approval of the responsible professional engineer of record for the building system and Versar's professional engineer of record.
- F. Building anchor bolts and base plates will be designed to resist the wall panel reactions produced by the design loadings. The quantity, size, grade, projection, and location of the anchor bolts will be shown on the anchor bolt setting plan.
- G. Provide non-metallic, non-shrink grout for setting of wall channel plates on the foundation.
- H. Building will be erected on a reinforced concrete foundation designed by Versar. Contractor will provide anchor bolts at appropriate locations.

## 2.02 STRUCTURAL FOUNDATION

- A. The structural foundation shall be constructed in accordance with the Plan Drawings and Section 03300.

## 2.03 STRUCTURAL FRAMING

- A. Structural Bracing
  - 1. Angle or channel bracing components will be placed across the building width to allow transmission of horizontal wind loads.
  - 2. All wind bracing components shall be galvanized steel with a nominal 14 gauge.
  - 3. Additional structural bracing shall be designed by the building manufacturers Professional Engineer and provided for additional wall and

ceiling live loads to include but not limited to building heaters, ventilation fans, wall mounted piping, sign age, lighting and air duct heater.

**B. Wall Panel Framing**

1. Exterior wall panels shall be of a single continuous length from the base channel to the roof line of the building at the side walls and end walls of the building, except where interrupted by wall openings.
2. Wall panels shall be a maximum 16" wide with a 3" deep inward turned interlocking side rib. Wall panels shall contain two 3/4" deep by 3 1/8" wide fluted recesses, each starting 2-7/16" from each panel edge..
3. Wall panels shall be fastened internally to the base channel and eave cap of the building with 3/8" diameter electrogalvanized machine bolts placed within the panel interlock. The fastening system shall be designed so that no wall fasteners are exposed on the exterior surfaces on the walls.
4. Provide factory-punched holes for panel connections.
5. Wall panels shall be nominal 24 gauge steel conforming to ASTM A 653-94 Specifications with the galvanized coating conforming to G90 standards. Minimum yield strength shall be 40,000 PSI.

**C. Shop Painting**

1. Surface preparation and shop prime painting will be per SSPC standards referenced in this Section.

**2.04 ROOF AND WALL PANELS AND ACCESSORIES**

- A. General: Roof and wall panels and accessories will be provided as part of the pre-engineered building package from a single approved supplier and from a single production run.
- B. Panel Description: Panels will be constructed of minimum 24 gauge sheet steel with a G90 zinc coating conforming to ASTM A653-94; will be factory cut to length and will be one piece from base to building eave or from building eave to ridge. The upper end of wall panels will be fabricated with a mitered cut to match roof panel corrugations. The bottoms of wall panels shall be straight-cut.

- C. Panel Design: All panels shall be in accordance with AISI specifications and shall be designed to meet the Design Criteria listed.
- D. Finish: Roof and wall panels exterior and interior surfaces will be factory prefinished and will require approval by Versar.
- E. Liner Panel: will be installed on the inside face of the girt system and will extend 8 feet above the floor unless shown otherwise. Base molding will be provided.
- F. Panel Fasteners: as shown on erection Plan Drawings and provided by manufacturer.
- G. Panel Accessories and Trim: exterior and interior trim as required for all doors, flashings, closures, etc.; exterior trim will be the same material, thickness, and finish as the exterior wall panels, or as approved by Versar.

## 2.05 ROOF AND WALL INSULATION

- A. Roof and wall panels will be insulated with a metalized polypropylene skimkraft faced fiberglass insulation blanket having a minimum "R" value of 5.4 for walls and 13.2 for ceiling insulation.
- B. Insulation blanket will have a flame spread rating of less than 25 and will have an Underwriter's Laboratories, Inc. label of approval. Insulation blanket will have a density of 0.6 pounds per cubic foot.

## 2.06 GUTTERS AND DOWNSPOUTS

- A. Gutters and downspouts will be provided and installed at locations to adequately direct water away from building openings, and will be as provided by the manufacturer and installed by the erector as part of the complete building package.
- B. Provide preformed steel corner closures matching the configuration of the gable trim and gutter.
- C. Provide preformed rubber weather seals to completely fill roof corrugation voids prior to gutter installation.
- D. Provide preformed galvanized steel wall closures to close corrugations in panel walls prior to gutter installation.

## 2.07 BUILDING ACCESSORIES

A. **General:** provide shop drawings and manufacturer's catalog data for each of the following components for approval. Submit in accordance with the requirements in Section 01301 as part of the complete building package.

1. **Steel Doors and Frames:** three (3) 3 feet x 6 feet-8 inches exterior personnel solid door, flush to exterior wall and located as shown on Plan Drawings; hinged on side nearest to building corner and opening to exterior; painted and finished, complete with lockset, closer, and hardware suitable for building occupancy requirements.
2. **Roll-up Door:** one (1) 10 feet wide x 10 feet high insulated, manually-operated, sectional overhead type steel garage door; installed on west exterior wall; painted and finished; complete with lock, tracks, supports and anchors, stops, miscellaneous hardware, trim, seals, and weatherstripping.
3. **Frames:** full-welded unit construction, with corners metered, reinforced, continuously welded full depth and width of frame; furnish floor and jamb anchors as required to secure frames.
4. **Hardware Items:** provide manufacturer's catalog data for the following items for approval:
  - a. Hinges
  - b. Locksets
  - c. Closers
  - d. Kick Plates
  - e. Stops
  - f. Door Bottoms, Sound/Weather Seals
  - g. Heads and Jambs, Weather Seals
  - h. Silencers
  - i. Threshold

Hardware items will conform to UBC requirements for building occupancy and use with respect to fire exit requirements. Finish on all items will be chrome plated, or as approved.

7. **Keying:** cylinders will be construction keyed for Contractor's use during construction period. Provide permanent keyed cylinder as directed by Versar for final acceptance, along with spare keys as required.

8. Explosion relief panels: Provide a minimum of two (2) one hour fire rated weathersealed explosion relief panels as per the requirements of the NFPA for a Class 1 Division 1, Group D process building. The panels, restraining chains and jamb sections shall be an integral unit installed with the wall panels and approved prior to installation.
9. Building Overhang: Provide an 8 feet wide by 46-feet long building overhang on the western side of the building. The roof section for the overhang shall be integral to the building roof with continuous roof panels from the roof ridge. The eave height of the overhang shall be a minimum of 10-feet 2-inches. The overhang shall include primed and painted roof columns and painted soffit panels to match the roof covering.
10. Additional wall penetrations: Provide additional sealed wall penetrations as required by Versar and the contractor for field piping. Minimum wall penetrations shall include
  - a. one 8-inch wall penetration along the southern wall for the Air Stripper Influent,
  - b. one 16-inch wall penetration along the western wall for the combined SVE and air stripper effluent pipes;
  - c. one 8-inch wall penetration along the western wall for the air stripper blower inlet air;
  - c. one 4-inch wall penetration along the northern wall for the waste water effluent connection;
  - d. two 4-inch wall penetrations along the eastern wall for fresh air intakes for the VP-1, VP-2 and AP-1 blowers.

B. Hardware Schedule: hardware will conform to HW1 and life safety requirements.

1. Personnel doors:  
Hinges  
Lockset  
Closer  
Kick plate (installed on interior face)
2. Overhead doors:  
Lockset  
Lifting device  
Tracks

### **C. Ventilation Requirements**

- 1. Structural framing supporting fans, grilles, and louvers will be adequate to carry design loads and negative pressures; coordinate with building structure and framing members.**
- 2. Fasteners will be stainless steel or aluminum series 5000 or 6000.**
- 3. Closed cell PVC compression gaskets will be provided between the bottom of the mullion or jambs and the wall to insure leak-tight connections.**
- 4. Provide manufacturer's catalog data for approval for all ventilation components.**
- 5. Provide two (2) 16-inch by 24-inch manual building louvers with bird screens and manual locking damper chains installed at the locations shown on the plans.**

### **D. Joint Sealers**

- 1. Elastomeric joint sealants will conform to ASTM C920 and will be of the type, grade, class, and use recommended by the manufacturer for the specified applications.**
- 2. Acrylic latex sealing compounds will conform to ASTM C834.**
- 3. Primer and sealant backers will be as recommended by the manufacturer.**
- 4. Interior applied sealants will be elastomeric or acrylic latex sealants. Sealant will remain flexible, without hardening or cracking, and will be nonstaining, nonbleeding, and colorfast.**
- 5. Sealants for moving joints and exterior application will be suitable for the intended application. Provide manufacturer's product literature for approval.**

## **2.08 MISCELLANEOUS APPURTENANCES**

- A. Building manufacturer will provide supplemental framing as required for the openings and attachments in the walls, roof, and other components as shown on the Plan Drawings.**

- B. Anchors and supports for mechanical and electrical equipment will be provided and installed by the Contractor. The pre-engineered metal building erector will consider loading effects of such equipment in the building design, including equipment support pads on floor of building.

### 3.0 EXECUTION

#### 3.01 GENERAL

- A. Building erection will conform to the AMERICAN INSTITUTE OF STEEL CONSTRUCTION Code of Standard Practice, approved erection drawings, building manufacturer's installation instructions, and AWS structural welding code.
- B. Building will not be erected until foundation work, plumbing, and other related work items have been constructed prior to the building installation and have been inspected and approved by appropriate agency and Versar.

#### 3.02 PREPARATION

- A. Contractor will provide Versar with building manufacturer's information including, but not limited to, the following prior to commencing with the building construction:
  - 1. Foundation dimensions, both horizontal and vertical, including overall building dimensions, door blockouts, required pilasters for building frame or endwalls, connections to foundation, and anchor bolt locations, sizes, and quantities.
  - 2. Building erection sequence.
  - 3. Final checks, both before placing of concrete and before commencing erection of the building, for conformance with the requirements of the building manufacturer's drawings.

#### 3.03 ERECTION

- A. Contractor will ensure that safety procedures for the erection of the building are strictly enforced, and that ties, stays, and temporary supports are positioned as necessary to keep the structure stable and secure at all times.

- B. Install non-metallic, non-shrink grout for setting of column base plates on the foundation. Grout will be installed in a manner to prevent voids and to present a neat, smooth finished appearance.

### **3.04 JOINT SEALANTS**

- A. Caulk exterior wall joints, between adjacent materials, joints between frames or louvers and adjacent materials, copings, and other joints required for the completion of the work.
- B. Caulk interior joints where required for weather tightness or neat appearance. Do not allow trapped moisture within or between caulked joints.
- C. Joints to receive sealant will be cleaned, primed, back stopped, caulked, and tooled in complete accordance with manufacturer's instructions.
- D. Do not proceed with the installation of sealants under adverse weather conditions, when joint to be sealed is damp, wet, or frozen, or when temperatures are outside the manufacturer's recommended installation range.
- E. Place exterior thresholds and sills in a full bed of sealant during setting procedures.
- F. Surfaces of materials adjoining sealed joints will be cleaned free of smears of sealant or other soiling due to caulking operations.
- G. Properly seal wall penetrations, such as louvers and pipe penetrations, for weather tightness.

### **3.05 CLEANUP AND CLOSEOUT**

- A. Field paint surfaces and touch up damaged surfaces to blend with surrounding areas, whether due to required cut-outs, penetrations, or by mishandling prior to and during erection.
- B. Throughout erection, remove and properly dispose of rubbish, debris, and waste material produced by erection work. No waste will be buried or burned on site. Secure stored materials from wind and weather damage until installed.
- C. Protect work from damage by others until final acceptance.



#### 4.0 MEASUREMENT AND PAYMENT

- A. Measurement and payment for work conducted in accordance with this Section and related Sections will be measured and paid for at the contract price based on materials delivered and on erection percent complete.

- END OF SECTION -

## **SECTION 15000: S.V.E. SYSTEM**

### **1.0 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Installation - Installing equipment furnished by others; supply & install remaining equipment; supply & install piping; and testing of mechanical systems.**
- B. Coordination - Coordinating installation with electrical equipment installation and building construction.**

#### **1.02 RELATED SECTIONS**

- A. Section 02661 - PVC Piping**
- B. Section 02662 -CPVC Piping**
- C. Section 02663 - Non-Metallic Valves and Components**
- D. Section 13121- Pre-Engineered Metal Building**
- E. Section 15200 - Vapor Phase GAC Vessels**
- F. Section 15980 - Pressure Testing of Piping**

#### **1.03 SUBMITTALS**

- A. In accordance with Section 01301 - Subcontractor Submittal Procedures.**
- B. Materials and Equipment: Submit manufacturer's product data in accordance with the Products Subsection of this Section. Include items necessary to install equipment but not separately specified, such as connective piping or tubing, fittings, and methods of connection for Versar's review.**
- C. Operation and Maintenance: Provide information on system operating sequence, including normal operational parameters such as temperature ranges, noise levels and electrical characteristics. Provide manufacturer's recommended start-up and shut down procedures for review and inclusion within the site O&M manual.**

- D. Warranties and Spare Parts: Submit manufacturer's warranties, lubrication and maintenance schedule, spare parts list and spare parts if shipped with units for Versar's review.

## 2.0 PRODUCTS

### 2.01 GENERAL

- A. Mechanical Package - Furnish items not supplied by others and install complete mechanical package, including vacuum pumping system, vapor phase GAC system, water removal system, vapor temperature control/heat exchanger system, subsurface and aboveground piping, tanks, pumps, valves, filters, gauges, meters, etc., into a complete and operable facility.
- B. Installation - Furnish and install supports and anchors, vibration dampening and isolation treatment, pipe insulation, supplemental heat and freeze protection, and allowance for pipe expansion.
- C. Supplemental Assistance - Provide assistance during checkout, operational testing and startup of the S.V.E. System.

### 2.02 VACUUM PUMPS (VP-1 and VP-2)

- A. Two vacuum pump skids (VP-1 and VP-2) with identical components shall be provided. Each skid shall be independently piped and controlled with all necessary fittings for field interconnection.
- B. Single stage, rotary lobe (Roots type), oil lubricated, 2,300 RPM at 52 brake horsepower.
- C. Rated for 1,200 SCFM at 10" Hg vacuum at approximately 500' above sea level.
- D. Blank-off (ultimate) pressure of 20" Hg vacuum.
- E. Constructed of cast iron, ductile iron and steel.
- F. Shaft seals shall be mechanical type.
- G. Pump bearings shall be external from the vacuum, and rated for 10,000 hours running life.

- H. Drive motor shall be 60 HP, TEFC, 1.800 RPM, 1.15 S.F., 230/460V, 60 HZ, 3 phase with V-Belt drive and OSHA approved guard provided.
- I. Vacuum pump and motor shall be factory mounted on an isolated low carbon steel frame system. The frame shall allow motor replacement, belt adjustment or shieve replacement with no disruption to blower piping or instrumentation. Pumps, motors and frame assembly shall be vibration isolated as required by the water knock-out tank (K-1) and heat exchanger (HX-1) manufacturers.
- J. A high discharge air temperature switch shall be provided and shall stop the pump motor on high discharge air temperature. Normal discharge temperature shall be 165°F. High temperature switch shall be set at 190°F.
- K. Skid piping shall include an air recirculating system, fresh air inlet system and a field adjustable vacuum relief valve.
- L. System shall be shop assembled, skid mounted and tested prior to shipment. Notify Versar one week prior to testing for witnessing.
- M. Vacuum pump shall be an M-d Pneumatics model number 7017 or Versar approved equal.

## **2.03 HEAT EXCHANGER (HX-1)**

- A. An air to water heat exchanger, compatible with all process gasses shall be provided after the vacuum pumps. The heat exchanger shall be rated for a maximum water flow rate of 7.5 gallons per minute of 55°F cooling water with a normal heat exchanger air discharge temperature less than 105°F. Heat exchanger shall be an Xchanger, Inc. Model C/TV 200 or Versar approved equal.

## **2.04 HORIZONTAL CENTRIFUGAL PUMPS (P-1, 2, 6 & 7)**

- A. Knockout Pump, P-1: 10 G.P.M. @ 40" TDH, 1.7' NPSHR, 4' NPSHA, 10" Hg vac. suction pressure, mechanical shaft seal, cast iron construction, 1½" flanged inlet x 1" flanged outlet. 1½" HP, 1750 RPM, TEFC, 1.15 S.F., 230V/460V., 60 HZ, 3 phase motor. Direct Coupled, mounted to base. Ingersoll Dresser or Versar approved equal.
- B. Transfer Pump, P-2: 30 G.P.M. @ 65' TDH, flooded suction at atmospheric pressure, mechanical shaft seal, stainless steel construction, 1.25" NPT inlet x 1.00" NPT outlet. 1.5 HP, 1750 RPM, TEFC, 1.15 S.F., 230V/460V., 60 Hz, 3 phase motor. Direct coupled and base mounted. Ebara Pump model CDK-70/3 with 5-3/16" impeller, or Versar approved equal.

- C. Sump Pump, P-6: 10 G.P.M. @ 20' TDH submersible pump with ¼ HP, 115V. Motor.
- D. Heat Exchanger Pump, P-7: 12 G.P.M. @ 45' TDH, flooded suction at atmospheric pressure, mechanical shaft seal, stainless steel construction, 1.25"NPT inlet x 1.00" NPT outlet. 0.75 HP, 1750 RPM, TEFC, 1.15 S.F., 230V/460V., 60 Hz, 3 phase motor. Direct coupled and base mounted. Ebara Pump model CDK-70/1 with 4-1/2" impeller, or approved equal.

## 2.05 DIAPHRAGM PUMPS (P-3,4&5)

- A. Trench Dewatering Pumps (P-3,4&5): Diaphragm pump, 2" size, 0 to 15 GPM, with 2 hp electric motor variable speed drive, 230/460V, 60Hz, 3ph.

## 2.06 TANKS (K-1, K-2 & S-1 )

- A. Knockout tank, K-1: Air/water separator, vertical steel tank rated for full vacuum, minimum 54" diameter, welded dished head bottom and full opening top, with davit. Two 10" vapor inlets, two 12" vacuum connections, one 2" water outlet and 6" clean-out flanged ports; three level gauge and four spare penetrations; and an internal demister are to be provided. All as shown on Versar sketch # SK-001, attached.
- B. Knockout tank, K-2: Secondary Air/water separator, 30" diameter, 12" inlet & outlet connections, with internal demister pad, three level switch ports, sight gauge, 6" flanged clean-out, 1" drain port and 1" discharge port. As shown on Versar sketch # SK-002 ,attached.
- C. Storage tank, S-1: water storage tank, 700 gallon capacity, low carbon steel skid tank, 48" wide x 72" long with an approved corrosion resistant epoxy liner. Tank shall include integral fork channels and a raised steel table top for mounting of the P-3, P-4 and P-5 dewatering pumps. Five 2-inch NPT inlet fittings will be installed within the tank top; four 1-inch NPT level control fittings and two 1.5-inch pump draw-off fittings shall be installed within the sides of the tank.

## 2.07 AIR INJECTION PUMP

- A. Regenerative blower: 370 cfm @ 5" Hg, 10 hp, 230/460V, 60hz, 3 ph., 3500 rpm motor, Spencer Vortex #VB-075, or Versar approved equal.

## **2.08 FILTERS AND STRAINERS**

- A. Vacuum Filters, F-1 and F-2:** Removable washable, polyester element type filter, sized for 1,200 SCFM @ 10" Hg vacuum shall be provided for each vacuum pump. Each filter shall be integrally mounted with the vacuum pump skids.
- B. Fresh Air Inlet Filter, F-3:** Removable washable, polyester element type filter/silencer sized for 300 scfm @ 10" Hg vacuum shall be provided for fresh air supply to the vacuum pumps. The filter shall be centrally mounted with one air intake penetration to the building exterior and individual flow control valving to each pump skid.
- C. Air Filter / Silencer, F-4:** Sized for 400 cfm @ 5"Hg.
- D. Heat Exchanger Water Strainer:** Y-type, in-line strainer, 2", PVC construction, with 1/32" perforations.

## **2.09 GRANULAR ACTIVATED CARBON**

- A. See Specification Section 15200.**

## **2.10 PIPING AND PIPING COMPONENTS**

- A. See attached equipment list and Specification Sections 02661, 02662, & 02663.**

## **2.11 Process BUILDING**

- A. Process Building -** The building shall be a pre-engineered metal building designed and erected in accordance with Specification Section 13121.
- B. Process Building Details -** The Building shall include interior lighting, convenience electrical outlets, space heater, ventilation system, manway doors, overhead door and other specified equipment.
- C. WWT Spills and Leaks -** In case of accidental discharge or spill from the wastewater treatment system, fluid must be contained and prevented from discharging to the ground surface. This will be accomplished by constructing a floor sump within the curbed building floor. The foundation system and containment system will be designed by Versar as outlined in Section 13121.
- D. Process Building Heating and Ventilation -** The building will be insulated and will be provided with heating and ventilation adequate to maintain interior

temperature ranging from 40 ° F (minimum) in winter to within 10 degrees of ambient outside temperature in summer.

- E. Process Building Exterior - No exterior finish requirements have been specifically identified; however, the building will be visually compatible with surround structures and be easily maintainable. Exterior maintenance requirements will be considered in evaluating alternatives. Color selections shall be selected by Versar and approved by the Owner.

### 3.0 EXECUTION

#### 3.01 GENERAL

- A. Installation - Installation of each item will be in accordance with manufacturer's recommend-ed methods, materials, and procedures. Notify Versar immediately if interferences with other work are discovered.
- B. Equipment Arrangement - Arrange installation with ample space for building entry and equipment servicing and maintenance. Coordinate with electrical work to provide space for location of panels, conduit, switches, and similar appurtenances. Provide at least the minimum clearances around control panels, electrical panels, and other devices as required by National Electrical Code (NEC). Provide access clearance around equipment in accordance with OSHA requirements.
- C. Piping - Piping will not be strained or bent, nor will tanks, vessels, pumps, or other work be supported by or develop strain or stress on the piping.
- D. Coordination - Coordinate mechanical installation work sequence with equipment vendors and electrical Contractor. Connections will be made by qualified personnel only.
- E. Supplemental Assistance - Provide assistance in start-up and operational testing.

#### 3.02 SCHEDULES

- A. Equipment Schedule: See attached Equipment List
- B. Process Piping Schedule: As indicated on the project drawings and the Equipment List.

#### **4.0 MEASUREMENT AND PAYMENT**

- A. Measurement and payment for work conducted in accordance with this Section and related Sections will be measured and paid for at the contract unit price for all labor and materials to install the S.V.E. System and process building on a percent complete basis.**

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**Note: The two page Equipment List and two sketches are attached to and made part of this Section.**



# SECTION 15000 EQUIPMENT LIST

Sheet 1 of

Item	Designation	Qty..	Media	Location	Description
Air/Water Separator	K-1	1	Vac/GW	Bldg.	See Section 15000, paragraph 2.06A
Air/Water Separator	K-2	1	Air / GW	Bldg	See Section 15000, paragraph 2.06B
Rotary Lobe Vacuum Pumps	VP-1 & VP-2	2	Air	Bldg	See Section 15000, paragraph 2.02
Carbon Absorbers	C-1 & C-2	2	Air	Bldg. Exterior	See Section 15200, paragraph 2.09
Knockout Pump	P-1	1	GW	K-1	See Section 15000, paragraph 2.04A
Transfer Pump	P-2	1	GW	S-1	See Section 15000, paragraph 2.04B
Trench Dewatering Pumps	P-3, P-4 & P-5	3	GW	Bldg	See Section 15000, paragraph 2.05
Sump Pump	P-6	1	Water	Bldg	See Section 15000, paragraph 2.04C
Heat Exchanger Transfer Pump	P-7	1	Water	Bldg	See Section 15000, paragraph 2.04D
Storage Tank	S-1	1	GW	Bldg	See Section 15000, paragraph 2.06C
Air to Water Heat Exchanger	HX-1	1	Air	Bldg	See Section 15000, paragraph 2.03
Air Injection Pump	AP-1	1	Air	Bldg	See Section 15000, paragraph 2.07
Pressure Indicator	PI-1 to ____		Vac	Various	Range 0-30" Hg Vac, 2" Dia.
Pressure Indicator	PI-		Air	Various	Range 0-5 PSI, 2" Dia.
Pressure Indicator	PI-		Water	Pumps	Range 0-60 PSI, 2" Dia.
Vacuum Filter	F-1 & F-2	2	Vac	VP-1 & 2	See Section 15000, paragraph 2.08A
Air Filter / Silencer	F-3	1	Air	VP-1 & 2	See Section 15000, paragraph 2.08B
Air Filter / Silencer	F-4	1	Air	AP-1	See Section 15000, paragraph 2.08C
Strainer	----	1	GW	Bldg	See Section 15000, paragraph 2.08D
Building Heaters	H-1 & H-2	2	Air	Bldg	See Section 13121, paragraph
Emergency Ventilation Fans	V-1 & V-2	2	Air	Bldg	See Section 13121, paragraph
Flex. Joints	8" Flex	2	Vac	VP-1 & 2	8" Flex. Connector, Part of Vac Pump Skid Assembly
Flex. Joint	12" Flex	1	Air	HX-1	12" Flex Joint x 12" long, NBR molded, 25psi rated @ 220 F.
Flex. Joint	1.5" Flex	2	GW	P-1 & 2	1.5" Flex Joint x 6" long NBR molded flange constr., 100 PSI rated at 180°F,

**SECTION 15000 EQUIPMENT LIST**

Sheet 2 of

Item	Designation	Qty.	Media	Location	Description
Low Temp. Piping Material	PVC	A/R	All	Various	PVC Piping - See Spec. Section No. 02661
High Temp. Piping Material	CPVC	A/R	Air	VP-1&2 Discharge	CPVC Piping - See Spec. Section No. 02662
Transfer piping with containment	Polyethylene	A/R	GW	Bldg to T-1	Environ "Geo-Duct" seamless, flexible pipe

## **SECTION 15200: VAPOR PHASE GRANULAR ACTIVATED CARBON**

### **1.0 GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Furnish skid mounted, transportable, self-contained granular activated carbon (GAC) vessels for field placement at the ENVIRO-CHEM site. Each vessel shall be a self-contained unit delivered to the site full of activated carbon and operable upon delivery.
- B. The contractor shall also provide either onsite change-out or complete vessel replacement services including transportation, disposal or regeneration services and carbon replacement in accordance with all EPA, Indiana and local regulations.
- C. The contractor shall be capable of providing two unique treatment trains dependant upon Versar's requirements. The initial treatment train will be based on two high volume GAC units operating at the site at any time during the initial "high vapor loading" period. The second treatment train will be four or more lower volume GAC units operating on a split treatment train.

#### **1.02 RELATED SECTIONS**

- A. Section 01301: Subcontractor Submittals
- B. Section 02661: PVC Piping & Fittings
- C. Section 02663: Non-Metallic Valves
- D. Section 15000: S.V.E. System

#### **1.03 SUBMITTALS**

- A. Submittals - Submit, in accordance with Section 01301, shop drawings and manufacturer's specifications for both the high volume GAC units and the low volume GAC units showing full details for vessel construction. Submit details and catalog information for components, accessories, and field connections.
- B. Base Requirements - Submit stabilized base requirements and GAC base loads for the placement of the units as indicated on the Plan Drawings. Also provide details

on space requirements for the placement and removal of the vessels and working room for monitoring of vessel operation.

- C. **Carbon Specifications** - Submit specifications of the proposed carbon type including sieve size, material of carbon origin, iodine number, moisture content, dust content, ash content and other characteristics. Also submit carbon usage calculations for the 2 treatment scenarios.
- D. **Change-Out Plan** - Submit a proposed change-out plan for the replacement and defining the disposal or regeneration of spent carbon. Include with this package all applicable permits for the regeneration facility, the proposed transportation method, example documentation for transportation and documentation of disposal or regeneration.
- E. **Points of Contact** - Submit a listing of all points of contact for the complete carbon service including dispatcher, trucking/transportation personnel, inventory control officer for stored carbon prior to disposal/regeneration, permit compliance officer and project manager.
- F. **Guarantee** - Submit a process performance guarantee based for the operation of the system.

#### **1.04 DELIVERY, STORAGE, AND HANDLING**

- A. **Protection** - Deliver, store, and handle prefilled carbon vessels so they will not be damaged or deformed. Prior to shipment all units shall be steam cleaned, painted and delivered in a rust-free condition.
- B. **Protection of Connections** - All threaded connections shall have plugs of a material equivalent to the connection with an inert thread seal lubricant as required to form a vapor tight seal.
- C. **Exterior Protection** - Prior to shipment, all internal parts and exposed exterior machined surfaces shall be protected by a rust preventative. All exterior metal surfaces will be cleaned of dirt and loose scale and will be painted per manufacturer's standard practices.

#### **1.05 QUALITY ASSURANCE**

- A. **The contractor shall certify prior to shipment of each vessel that the carbon quality meets or exceeds the specifications submitted as per item 1.03.C. above.**

- B. The contractor shall certify prior to shipment of each vessel that each vessel has been inspected and tested for vapor leaks at a pressure twice the rated back pressure.

## 1.06 QUALIFICATIONS

- A. The contractor shall be familiar with carbon systems, with a minimum of five years experience and documented performance on at least five similar projects.
- B. All contractor site personnel shall be trained and medically monitored and familiar with Hazardous Waste site operations, as per OSHA, EPA and Indiana requirements.

## 2.0 PRODUCTS

### 2.01 GENERAL

- A. All materials and products shall be first quality, like-new and furnished in strict accordance with this specification.
- B. The contractor/manufacture shall provide a complete turnkey service including the carbon vessels, activated carbon, carbon replacement services and carbon disposal/regeneration.

### 2.02 DESIGN CRITERIA

- A. Initial Absorber Vessels
  - 1. Two vapor phase absorption vessels will initially be utilized to remove volatile organic compounds (VOC's) from the vapor stream from the SVE extraction and air stripping processes.
  - 2. The initial maximum air flow will be 3,800 scfm at an inlet pressure of 1.5-inches of Hg. Each vessel shall operate with less than 0.35-inches of Hg back pressure at full air flow.

3. Each absorber vessel shall provide a minimum of 10,000 pounds of activated carbon capacity. Carbon type and specifications will be based on the manufacturer's recommendations in conjunction with the requirements of this specification. Table 15200-1 defines the maximum vapor phase influent concentrations to the initial absorbers.

<b>Table 15200-1 Initial Contaminant Concentrations</b>		
<b>Contaminant</b>	<b>Influent Concentration (ppm-v)</b>	<b>Allowable Effluent Concentration (ppm-v)</b>
Chloroform	80	< 2
1,1 Dichloroethane	35	< 2
Methylene Chloride	140	< 2
1,1,1 Trichloroethane	300	< 2
Tetrachloroethane	100	< 1
Toluene	200	< 2
Trichloroethylene	30	< 1

4. The absorber vessels will be operated in series to provide a lead/ lag operational arrangement.
5. The interior of the absorbers will be coated to prevent corrosion.

**B. Second Phase Absorber Vessels**

1. A minimum of four vapor phase absorption vessels will be utilized during the second phase of the project to remove volatile organic compounds (VOC's) from the vapor stream from the SVE extraction and air stripping processes.
2. The maximum air flow during this phase of the project will be 2,000 scfm at an inlet pressure of 1.5-inches of Hg. Each vessel shall operate with less than 0.35-inches of Hg back pressure at full air flow.
3. Each absorber vessel shall provide a minimum of 3,000 pounds of activated carbon capacity. Carbon type and specifications will be based on

the manufacturer's recommendations in conjunction with the requirements of this specification. Table 15200-2 defines the maximum vapor phase influent concentrations to the absorbers.

<b>Table 15200-2</b> <b>Second Phase Contaminant Concentrations</b>		
Contaminant	Influent Concentration (ppm-v)	Allowable Effluent Concentration (ppm-v)
Chloroform	10	< 2
1,1 Dichloroethane	10	< 2
Methylene Chloride	20	< 2
1,1,1 Trichloroethane	50	< 2
Tetrachloroethane	60	< 1
Toluene	40	< 2
Trichloroethylene	20	< 1

4. The absorber vessels will be operated in a parallel train operation with a minimum of four units; with a two primary and two secondary series lead/lag operational arrangement.
5. The interior of the absorbers will be coated to prevent corrosion.

C. Performance Warranty

1. After having reviewed the estimated influent vapor concentrations in Table 15200-1 and 15200-2, the manufacturer shall guarantee system hydraulic performance at the anticipated flow rates and operating modes.

## 2.03 MATERIALS OF CONSTRUCTION

- A. Materials of construction used by the manufacturer of all components provided will be compatible with the influent vapor concentrations at all component design temperatures and pressures. The interior of all components will be coated as applicable in accordance with the manufacturer's written standard procedures.

## **2.04 TESTING AND INSPECTIONS**

- A. Each completed unit will be inspected at the manufacturer's facility following the manufacturer's written procedures. The manufacturer is responsible for any third party inspections required by law of specification.**
- B. Versar reserves the right to inspect each completed unit at the manufacturer's facility prior to shipment. Inspection by Versar does not constitute a waiver of requirements, nor does it relieve the manufacturer of his responsibilities.**

## **3.0 EXECUTION**

### **3.01 EQUIPMENT**

- A. All equipment will be furnished in accordance with this specification. Vapor phase granular activated carbon vessels with carbon shall be supplied and placed at the jobsite.**
- B. Upon sufficient decline in air flow and vapor concentrations, Versar shall notify the manufacturer to remove the "large volume" initial carbon vessels and replace these vessels with a minimum of four smaller vessels. The manufacturer shall be ready and able to replace these units within seven business days.**

### **3.02 SERVICE**

- A. The supplier of the vapor phase carbon units will have full service capability. Full service capability includes, but is not limited to, supply, and delivery of the vessels and carbon; carbon regeneration; carbon removal and replacement; carbon transportation both to and from the regeneration site.**
- B. Complete carbon replacement shall occur at the request of Versar and require no more than three business days for scheduling.**

## **4.0 MEASUREMENT AND PAYMENT**

- A. Measurement and payment for the carbon services will be determined after choice of manufacturer.**

**- END OF SECTION -**



## SECTION 15980: PRESSURE TESTING OF PIPING

### 1.0 GENERAL

#### 1.01 SECTION INCLUDES

- A. Pressure testing of piping .

#### 1.02 SUBMITTALS

- A. Submittals -In accordance with Section 01301, Subcontractor Submittal Procedure.
- B. Submittal Schedule - Include detailed procedures, agenda, and sample report forms five days prior to commencing system testing.
- C. Witnessing - Versar or Versar's representative will witness all testing.
- D. Test Record Submittal Schedule - Submit test records to Versar upon completion of test within 24 hours.

#### 1.04 QUALIFICATIONS

- A. Perform work under inspection of Versar or Versar's representative.

### 2.0 PRODUCTS

#### 12.01 MATERIALS AND EQUIPMENT

- A. Provide potable water as hydrostatic testing fluid.
- B. Provide source of low pressure compressed air.
- C. Provide pressure gauges, pipes, bulkheads, pumps, valves, and meters to perform Testing.

### 3.0 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that piping and treatment system is complete and operational before commencing work.
- B. Beginning of work means acceptance of existing conditions.
- C. Utilize piping pressure tests specified herein.

### **3.02 PREPARATION**

- A. Piping - Pipes will be in place and anchored before commencing pressure testing.
- B. Pipe Flushing/Cleaning - Flush pipes to remove dirt and debris prior to performing testing.
- C. Pressure Testing - Conduct pressure tests on exposed and aboveground piping after piping has been installed and attached to pipe supports, hangers, anchors, expansion joints, and valves. If meters or other non-pressure rated items are in place, protect from internal and external damage when testing piping.
- D. Pipe Testing Equipment Isolation - Isolate piping from non-pressure rated equipment and instruments prior to testing.
- E. Testing Requirements - Perform initial testing on buried piping with trench partially backfilled and joints exposed. Final testing of buried piping to be performed after trench has been completely backfilled and compacted.

### **3.03 HYDROSTATIC TESTING OF PRESSURE PIPING**

- A. Air Purging - Open vents at high points of piping system to purge air while pipe is being filled. Venting may be provided by temporarily loosening flanges.
- B. Pressure Testing - Subject piping system to test pressure of 75 psig. Maintain test pressure for a minimum of one hour.
- C. Inspection - Examine joints, fittings, valves, and connections for leaks. Piping system will show no leakage or weeping.
- D. Corrective Measures - Correct leakage or weeping and retest system until no leakage or weeping occurs.

### **3.04 TESTING OF CONTAINMENT, VACUUM, & LOW PRESSURE PIPING**

- A. Testing - Testing of containment piping shall follow completion of primary

(inner) pipe testing.

- B. Testing Pressure - Testing shall be by low pressure air.
- C. Testing Conditions - Utilizing a low pressure air source, slowly pressurize to 3 to 5 psig and hold for 30 minutes. Soap all connections, joints, seams, etc. and observe for bubbles.
- D. Corrective Measures - Correct all leaks and retest until no leaks are found.

### 3.05 TESTING OF GRAVITY FLOW PIPING

- A. Testing - Testing of gravity flow piping, above or below grade, accomplished by determining specific volume of water lost through a known length of pipe over the specific period of time.
- B. Hydrostatic Testing - Hydrostatic water level of pipe system raised to height of at least 3 feet above highest point in line, or as approved by Versar.
- C. Testing Period - Maintain closed system test for minimum of one hour.
- D. Acceptance Criteria - Pipe testing unacceptable until measured quantity is less than 25 gallons per inch of diameter of pipe per mile of pipe per 24 hours.
- E. Corrective Measures - All visible leaks repaired and documented regardless of measured leakage.
- F. Corrective Measures - Leakage in buried pipe located, documented, and repaired as soon as possible if above allowable leakage rate.
- G. Pressure Testing - Utilize low pressure water or air for lines where hydrostatic water level is not practical, with induced pressure of 3 to 5 psig maintained continuously for minimum of 5 to 10 minutes without drop in pressure.

### 4.0 MEASUREMENT AND PAYMENT

- A. Separate measurement and payment will not be made for work required under this Section. All costs in connection with the work specified herein will be considered to be included in the applicable related items of work in the Bid Schedule.

- END OF SECTION -

## **DIVISION 13 - SPECIAL CONSTRUCTION**

### **SECTION 13110 - WASTEWATER TREATMENT SYSTEM**

**Rev. 6, 10/21/97 By Versar**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION OF WORK**

- A. This section covers the requirements for both a permanent on-site wastewater treatment system and a temporary wastewater treatment trailer to be used during periods of high flow. The systems shall be used to treat wastewater generated during both construction and operation phases of the project, including during the excavation and operation of the SVE system. Both wastewater treatment systems consist of filtration, air stripping, and activated carbon adsorption. They are intended primarily for the removal of organic contaminants and suspended solids. The treatment system may include a chemical oxidation system for iron removal and an oil/water separator for removal of free oil and grease, if needed based on performance of the wastewater treatment system. The chemical oxidation system is an optional contingency measure and is described in Section 13111 - CHEMICAL OXIDATION SYSTEM FOR IRON REMOVAL (Contingency Measure). The oil/water separator is an optional contingency measure and is described in Section 13112 - OIL/WATER SEPARATOR (Contingency Measure).

The wastewater treatment system Process and Instrumentation Diagram is shown on Versar drawing # 3709-302.

##### **1.02 RELATED SECTIONS**

- A. Section 13121 - PRE-ENGINEERED METAL BUILDING
- B. Section 13210 - SITE OPERATIONS AND MAINTENANCE
- C. Section 13050 - WASTEWATER STORAGE AND TRANSFER SYSTEMS
- D. Section 15200 - VAPOR PHASE GRANULAR ACTIVATED CARBON SYSTEM

##### **1.03 PERFORMANCE REQUIREMENTS**

- A. The following specification defines the requirements for both the permanent and the temporary wastewater treatment processes, except as noted in Sections 2.01 and 2.02 below). Both treatment trains shall have a minimum treatment capacity of 35 gpm. Wherever possible identical equipment shall be used for the permanent wastewater treatment system and the temporary wastewater treatment system.

- B. The filtration system shall be constructed to remove all solids greater than 10 microns. The filtration system for each process shall be capable of achieving this performance at a flow rate of 35 g.p.m. All water shall pass through the filtration system prior to flowing into the carbon treatment units. The filtration system shall produce an effluent with less than 30 mg/l solids or IDEM discharge standards for solids, whichever is more stringent. The maximum pressure drop across the filtration system shall not exceed 25 psig. Contractor shall supply inlet raw wastewater to the treatment system, pre-screened through a 100 micron filter. Contractor shall supply at least two filter packages consisting of two bag filters (50 and 25 micron) per filter package, plus at least two 10 micron bag filters, all sized for a flow of 35 g.p.m.
- C. The air stripper system shall be a shallow tray type, designed to strip a wastewater flow rate of 35 g.p.m., with a minimum ambient air stream of 500 cfm. The stripper shall be capable of reducing liquid phase methyl chloride to five (5) parts per billion (ppb). The system shall include dual 3 HP centrifugal air stripper effluent pumps and a minimum of four (4) shallow trays. All wetted parts of the feed pumps shall be of non-metallic construction.
- Feed to the stripper shall be supplied by two (2) Ebara International stainless steel, or equal, water pumps (P100A and P100B). The pumps shall be able to handle solids loading expected in tank T2 (<100 micron), and each supply a constant flow of 35 g.p.m. through the primary filters and to the air stripper unit.
- D. The two (2) liquid phase granulated activated carbon (GAC) units shall contain 800 lbs. of granular activated carbon each, and be capable of treating 35 g.p.m. each, while operating in series. Construction shall be reinforced fiberglass. The carbon units shall be capable of treating the site wastewaters to achieve the IDEM effluent standards established for discharge on-site, when preceded by the air stripper. The liquid phase GAC units shall be ASME code rated for 100 psi.
- E. As defined within Section 13100 - Soil Vapor Extraction System, Part 2.01 E. The air effluent stream from the air stripper shall be combined with the Soil Vapor Extraction off-gas stream to be treated in combination by one set of vapor phase granular activated carbon units. The vapor phase GAC units shall treat the stripper off-gases to below IDEM limits.
- F. The entire wastewater treatment system shall be capable of maintaining operation while either one liquid phase or one vapor phase absorber is being serviced. The entire system shall be capable of operating at all pressure ranges required for continued system operation, over a temperature range from 55 to 140 °F, while flow rate is 35 g.p.m.. The system shall also be capable of intermittent operation, or 24 hour continuous treatment of the raw wastewater.
- G. The Contractor shall provide all appurtenances and controls for the system that are required for proper and safe operation, in addition to those shown in the process drawings. The equipment and controls shall meet the product requirements of these

specifications.

- H. The Contractor shall provide bubble diffusers for storage tank T2. The aerators shall be submerged and shall supply at least 0.14 mg/l oxygen to the wastewater per mg/l of iron oxidized. The aerators shall be installed on the southern half of the tank bottom in a spoke and hub pattern.

#### 1.04 SUBMITTALS

- A. The following shall be submitted in accordance with Section 01300.
1. Manufacturer's catalog data for all system components or equivalents, composed of catalog cuts, brochures, circulars, specifications and product data, and printed information in sufficient detail and scope shall be submitted to the Enviro-Chem Trustees Engineer for approval prior to installation.
  2. Detailed shop drawings shall be submitted to show equipment and piping layouts, location of vessels, pumps, piping connections and support points within the Wastewater Treatment Building. Shop drawings shall identify variations from the design drawings.
  3. Upon completion of installation and testing, test reports shall be submitted for all field tests conducted to prove compliance with the performance requirements. System start-up and testing is described in Specification Section 13210 - SITE OPERATIONS AND MAINTENANCE, Part 3.06.

### **PART 2 - PRODUCTS**

#### 2.01 PERMANENT WASTEWATER TREATMENT SYSTEM

- A. The Contractor shall supply a raw wastewater treatment system which consists of the following elements:
1. One (1) Carbonair Model STAT-180 shallow tray air stripper unit, with associated single blower and dual centrifugal transfer pumps, all located on a common skid; or Radian's concurrence with Versar of an equivalent.
  2. A minimum of two vapor phase carbon units as defined within Specification Section 15200 - Vapor Phase Granular Activated Carbon.
  3. Two (2) Carbonair Model PC-7 liquid phase granular activated carbon vessels (reinforced fiberglass construction), or Radian's concurrence with Versar of a performance equivalent.
  4. One (1) Carbonair 7.5 kW in-line duct heater designed for 900 cfm flow rate

and a 100 °F effluent temperature, or Radian's concurrence with Versar of a performance equivalent.

5. Three (3) Pipe and Valve Assemblies or Radian's concurrence with Versar of a performance equivalent as shown on the drawings.
6. Two (2) Ebara International stainless steel transfer pumps (P100A or P100B), Model number 32-160B, TEXP, for 70 g.p.m. @ 140' tdlh or their approved performance equivalent for feed into either or both of the wastewater treatment systems.
7. Check Valves - PVC or Brass bodied check valves sized for 2 inch pipes; True Check model from Hayward Industrial Products, or Radian's concurrence with Versar of a performance equivalent.
8. Piping - PVC construction, 2 inch schedule 80 for liquid service, or Versar's approved performance equivalent.
9. Ball Valves - Hayward Ind. Products true union type, PVC construction, sized for 2 inch piping, or Radian's concurrence with Versar of a performance equivalent.
10. Sample Valves - Hayward Ind. Products, PVC constructed, ½ inch true union ball valves, or Radian's concurrence with Versar of a performance equivalent.
11. Bag Filters - Four (4): 1 each 50 micron, 1 each 25 micron, and 2 each 10 micron all FSI model FSPN-85, with 2 inch pipe connections, or Radian's concurrence with Versar of a performance equivalent. Filters shall have floor supports with adjustable height mounting legs, all filters shall have 3/4 inch drain connections.
12. Flow Totalizer/Indicators - Badger Meter Model M-70 with optional totalizer, or Radian's concurrence with Versar of a performance equivalent.
13. Pressure Indicators - Marsh gauges: 2 ½ inch dial size with 0 to 200 psig readout, 1/4 inch male bottom connection, and plain case or Radian's concurrence with Versar of a performance equivalent.
14. Globe Valve - One (1) Asahi globe flow-control valve with 2 inch socket fittings, or Radian's concurrence with Versar of a performance equivalent.
15. Three-Way Valves - Hayward PVC constructed true union 3-way ball valves, sized for 2 inch piping, flange connectors with gaskets, or Radian's concurrence with Versar of a performance equivalent.

16. Sump Pump - One (1) submersible sump pump, ½ HP with appropriate length hose to reach tank T2, or Radian's concurrence with Versar of a performance equivalent. Sump system shall be built on-site to meet site requirements.
17. Flexible Ducting - Round ducting, 8 inch minimum, heavy duty rated nitrile coated nylon, type 351 as supplied by Flexmaster, or Radian's concurrence with Versar of a performance equivalent.
18. Vapor Phase Piping - 8 inch minimum PVC ducting by Spears, or Radian's concurrence with Versar of a performance equivalent.
19. Duct Heater - Carbonair 7.5 kW in line duct heater, or Radian's concurrence with Versar of a performance equivalent. Automatic temperature controls and connections to PLC to be supplied by heater vendor and shall meet all applicable electrical specifications.
20. Butterfly Valves - Asahi brand, Onmi series for 8 inch minimum piping, flanged, with Viton seals and gaskets, designed for vapor phase use, or their approved performance equivalent.
21. Quick connect/disconnect couplings - PT brand adaptors and couplers sized for 2 inch fittings and pipe connection, or Radian's concurrence with Versar of a performance equivalent.
22. Quick connect/disconnect couplings - PT brand adaptors and couplers sized for 8 inch fittings and pipe connection, or Radian's concurrence with Versar of a performance equivalent.
23. Pipe supports - B-Line® channel system or Radian's concurrence with Versar of a equivalent shall be anchored to building structure (walls or trusses) as required to support equipment and piping loads. Anchoring type and method to be determined by contractor prior to installation. Located as depicted on the drawings.
24. Pipe clamps, hanger anchors and other pipe appurtenances - To be determined by contractor. Must be appropriate for proper mating with pipe supports. Size and material to be determined by contractor, and must be appropriate for anticipated loadings.
25. Pressure hose and barbs - To be determined by contractor, and shall be designed for high pressure use of 150% of maximum anticipated pressure.
26. Hard piping components - All tees, elbows, reducers, plugs, adapters, and other hard piping components shall be supplied by contractor and shall be in accordance with ASTM D 1784.



**Note:** For all component counts not specified above, please refer to Process and Instrumentation Diagram, Versar drawing # 3709-302.

The primary filter and both GAC systems shall be configured to operate in series so that one treatment unit will be the primary absorber (lead) while the other treatment unit will act as a backup (lag). In both systems, the piping shall enable one unit to be isolated for disconnection and change-out while maintaining operation through the other.

**B. The Contractor shall provide a filtration system to remove suspended solids from the wastewater prior to its treatment by carbon adsorption.**

1. The filtration unit shall be four (4) bag filters--set in series; two bag filters shall be located before the air stripper (BF-1 and BF-2) while two bag filters will be located after the air stripper (BF-3 and BF-4).

Sufficient bag filters of various micron size shall be provided to remove suspended solids and maintain sufficient flow to the carbon treatment units. Bag cleaning may be performed on-site, as needed. Twenty spare bags shall be provided on-site, and installed so as not to disrupt treatment system operations during cleaning of spent media. All removed solids and wastewaters generated by cleaning shall be managed in accordance with Section 02080-REMEDIAL ACTION GENERATED WASTES.

2. Filtration system components, including vessels, piping, cartridges and filter media shall be chemically compatible with site wastewaters. The system components shall be corrosion resistant, and located as shown in the process and instrumentation diagrams.

**C. Wastewater Treatment Feed Pumps (P100 A & B).**

1. The wastewater treatment pumps (P100 A & B) shall be stainless steel centrifugal pumps: Model 32-160B as manufactured by Ebara International, or Radian's concurrence with Versar of an equivalent. The wastewater pumps shall be piped to feed either or both of the wastewater treatment systems.

Each pump shall meet the following minimum design requirements and functional characteristics:

- a. 70 g.p.m. @ 140 Ft TDH
- b. 2-inch intake - flanged
- c. 1.25-inch discharge - flanged
- d. 3,450 RPM operating speed
- e. 460 Volt 3-phase power
- f. 5 HP rating
- g. Stainless steel wetted parts
- h. Fully-enclosed explosion-proof motor
- i. No linings or laminations

The pumps shall be housed within the process building, with influent pipes running above grade to the permanent treatment system also housed within the process building; and exposed, heat traced and insulated influent pipes running to the temporary wastewater treatment trailer..

2. The Contractor shall provide an additional spare pump for the wastewater treatment pumps (P100 A/B). The piping connections to the wastewater treatment pumps shall be able to be quickly disconnected.
3. Control switches shall be installed to shut down the wastewater pumps if the following condition is met:
  - a. Water level in storage Tank T1 or T2 drops to 12 inches above the floor drain.
  - b. Water level in storage Tank T3 rises to within 12 inches of top of the sidewall rail.

D. Wastewater Treatment Shallow Tray Air Stripper.

1. The wastewater treatment air stripper shall be a shallow tray design; Model: STAT-180 or Radian's concurrence with Versar of an equivalent as manufactured by:

Carbonair  
2731 Nevada Avenue North  
New Hope, MN 55369  
(612) 544-2154

This stripper shall meet the following minimum design requirements and functional characteristics:

- a. 35 g.p.m. minimum operational liquid flowrate
- b. 900 cfm minimum operational vapor flowrate
- c. 6 inch inlet and discharge ports - vapor side
- d. 2 inch inlet and discharge ports - liquid side
- e. 460 Volt 3-phase power
- f. Dual air stripper effluent pumps
- g. 3 Horsepower effluent pump rating
- h. 5 Horsepower blower rating
- i. 7.5 kW duct heater
- j. All components mounted on a common skid
- k. All components explosion proof

The stripper system shall be housed within Process Building, in accordance with process diagrams.

- 3. Control switches shall be installed to shut down the wastewater stripper if any of the following condition is met:
  - a. Water level in stripper sump drops to 1 inch above the floor drain.
  - b. Water pressure in the carbon units downstream rises to level set by the manufacturer.
  - c. Low air pressure in the air stripper.

**E. Backwash Pump.**

- 1. One portable backwash pump capable of 140 g.p.m. and 85 psi, with 2 inch connections and cable and plug connector. Control switches, as itemized on the process and instrumentation drawings. All appropriate controls for safe operation, including control of flowrate and pressure indicator shall be supplied by contractor. Supply water shall be from tank T3 and effluent backwash shall be routed to tank T1. Contractor shall be responsible for supplying all necessary appurtenances, including, but not limited to: adequate lengths of flexible tubing, couplings, and power.

**F. Sump Pumps.**

- 1. One ½ hp, 115V sump pump with level controls for installation in the wastewater treatment system building sump area.

#### G. Meters/Gauges.

All electrical meters and gauges shall be rated for use in Class I Division I areas.

1. One pressure gauge (range 0 to 24-inches of water) shall be installed on the discharge side of the air stripper, and prior to the vapor carbon units; another pressure gauge (range 0 to 24-inches of water) shall be installed between the two vapor carbon units; and one pressure gauge (range 0 to 24-inches of water) shall be installed downstream of the final vapor phase carbon absorber unit.
2. One temperature gauge (0 to 150°F) shall be installed on each of the vapor phase discharge pipes.
3. One flow meter (magnetic or paddle wheel type, 0 to 150 g.p.m.) with totalizer and flow indicator shall be installed on the wastewater pump (P100A&B) discharge pipe to both the permanent and temporary wastewater treatment processes. A second flow meter and totalizer shall be installed downstream of the liquid phase absorbers. These flow meters shall include a digital totalizer. The totalizer shall be located at a convenient location for monitoring by on-site personnel.
4. Pressure gauges (range 0 to 100 psi) shall be installed on the bag filters (BF-1 and BF-2 inlet side), and upstream of the secondary bag filter units (BF-3 and BF-4).
5. One pressure gauge (range 0 to 50 psi) shall be installed on the discharge side of the air stripper sump pumps, and prior to the liquid carbon units; another pressure gauge (range 0 to 50 psi) shall be installed between the two liquid carbon units; and one pressure gauge (range 0 to 50 psi) shall be installed downstream of the final liquid phase carbon absorber unit.

#### H. Bubble Diffuser

1. The Contractor shall provide a bubble diffuser secured to the wall or floor of storage tank T2. The aerator shall be designed to maintain sufficient pressure on headers to eliminate clogging of diffusers. Oxygen transfer rate shall be at least 0.9 kg oxygen per kilowatt hour. A check valve shall be included in the over the wall piping from the air blower to the diffuser to avoid water flow to the blower.

#### I. Miscellaneous Instrumentation.

1. Instrumentation not otherwise specified herein, but shown on the Process and Instrumentation Diagram, Versar drawing # 3709-302, shall be supplied by

the Contractor and installed per the drawings for proper operation given the process dynamics, as described in the specifications package. All instrumentation supplied shall be new and in proper working order. Damaged or malfunctioning equipment will be replaced by the Contractor at the Contractor's expense, after approval by Versar.

## **2.02 TEMPORARY PORTABLE WASTEWATER TREATMENT SYSTEM**

**A. The Contractor shall supply a portable wastewater treatment system, which consists of the following elements for additional treatment during periods of peak flow:**

- 1. One (1) Environmental Services Engineering shallow tray air stripper unit, with associated single blower and dual centrifugal transfer pumps, all located within a common portable trailer; or Radian's concurrence with Versar of an equivalent.**
- 2. A minimum of two vapor phase carbon units as defined within Specification Section 15200 - Vapor Phase Granular Activated Carbon.**
- 3. Two (2) Carbonair Model PC-7 liquid phase granular activated carbon vessels (reinforced fiberglass construction), or Radian's concurrence with Versar of a performance equivalent.**
- 4. Two (2) Pipe and Valve Assemblies or Radian's concurrence with Versar of a performance equivalent as shown on the drawings for the air stripper and GAC system influent piping.**
- 5. Check Valves - PVC or Brass bodied check valves sized for 2 inch pipes; True Check model from Hayward Industrial Products, or Radian's concurrence with Versar of a performance equivalent.**
- 6. Piping - PVC construction, 2 inch schedule 80 for liquid service, or Radian's concurrence with Versar of a performance equivalent.**
- 7. Ball Valves - Hayward Ind. Products true union type, PVC construction, sized for 2 inch piping, or Radian's concurrence with Versar of a performance equivalent.**
- 8. Sample Valves - Hayward Ind. Products. PVC constructed. 1/4 inch true union ball valves. or Radian's concurrence with Versar of a performance equivalent.**
- 9. Bag Filters - Four (4): one each 50 micron, one each 25 micron, and two each 10 micron all FSI model FSPN-85, with 2 inch pipe connections, or Radian's concurrence with Versar of a performance equivalent. Filters shall have floor supports with adjustable height mounting legs, all filters shall have 3/4 inch**

drain connections.

10. Flow Totalizer/Indicators - Badger Meter Model M-70 with optional totalizer, or Radian's concurrence with Versar of a performance equivalent.
11. Pressure Indicators - Marsh gauges; 2 ½ inch dial size with 0 to 200 psig readout, 1/4 inch male bottom connection, and plain case or Radian's concurrence with Versar of a performance equivalent.
12. Globe Valve - One (1) Asahi globe flow-control valve with 2 inch socket fittings, or Radian's concurrence with Versar of a performance equivalent.
13. Flexible Ducting - Round ducting, 8 inch minimum, heavy duty rated nitrile coated nylon, type 351 as supplied by Flexmaster, or Radian's concurrence with Versar of a performance equivalent.
14. Vapor Phase Piping - 8 inch minimum PVC ducting by Spears, or Radian's concurrence with Versar of a performance equivalent.
15. Knife Style Air Dampers - 8 inch minimum piping, socketed, with Viton seals and gaskets, designed for vapor phase use, or Radian's concurrence with Versar of a performance equivalent.
16. Quick connect/disconnect couplings - PT brand adaptors and couplers sized for 2 inch fittings and pipe connection, or Radian's concurrence with Versar of a performance equivalent.
17. Pipe supports - B-Line® channel system or equivalent shall be anchored to building structure (walls or trusses), as required to support equipment and piping loads. Anchoring type and method to be determined by contractor prior to be appropriate for anticipated loadings.
18. Pipe clamps, hanger anchors and other pipe appurtenances - To be determined by contractor. Must be appropriate for proper mating with pipe supports. Size and material to be determined by contractor, and must be appropriate for anticipated loadings.
19. Pressure hose and barbs - To be determined by contractor, and shall be designed for high pressure use of 150% of maximum anticipated pressure.
20. Hard piping components - All tees, elbows, reducers, plugs, adapters, and other hard piping components shall be supplied by contractor and shall be in accordance with ASTM D 1784.

Note: For all component counts not specified above, please refer to Process and Instrumentation Diagram, Versar drawing 3709-302.

The primary filter and both GAC systems shall be configured to operate in series so that one treatment unit will be the primary absorber (lead) while the other treatment unit will act as a backup (lag). In both systems, the piping shall enable one unit to be isolated for disconnection and change-out while maintaining operation through the other.

**B. The Contractor shall provide a filtration system to remove suspended solids from the wastewater prior to its final treatment by carbon adsorption.**

1. The filtration unit shall be four (4) bag filters—set in series; two bag filters shall be located before the air stripper (BF-1 and BF-2) while two bag filters will be located after the air stripper (BF-3 and BF-4).

Sufficient bag filters of various micron sizes shall be provided to remove suspended solids and maintain sufficient flow to the carbon treatment units. Bag cleaning may be performed on-site as needed. Twenty spare bags shall be provided on-site and installed so as not to disrupt treatment system operations during cleaning of spent media. All removed solids and wastewaters generated by cleaning shall be managed in accordance with Section 02080-REMEDIAL ACTION GENERATED WASTES.

2. Filtration system components, including vessels, piping, cartridges and filter media shall be chemically compatible with site wastewaters and chemical treatment, if any, is used. The system components shall be corrosion resistant, and located as shown in the Process and Instrumentation Diagram, Versar drawing # 3709-302.

**C. Combined Wastewater Treatment Feed Pumps (P100 A & B).**

1. The pumps shall be housed within the process building, with influent pipes running above grade to the permanent treatment system also housed within the process building; and exposed, heat traced and insulated influent pipes running to the temporary wastewater treatment trailer.

**D. Temporary Wastewater Treatment Shallow Tray Air Stripper.**

1. The temporary wastewater treatment air stripper shall be a shallow tray design; Model: ESE-435 or Radian's concurrence with Versar of an equivalent as manufactured by Environmental Science Engineering, Inc.

This stripper shall meet the following minimum design requirements and functional characteristics:

- a. 35 g.p.m. minimum operational liquid flowrate
- b. 500 cfm minimum operational vapor flowrate
- c. 6 inch inlet and discharge ports - vapor side
- d. 2 inch inlet and discharge ports - liquid side
- e. 240 Volt 1-phase power
- f. Dual air stripper effluent pumps
- g. 3 Horsepower effluent pump rating
- h. 5 Horsepower blower rating
- i. All components mounted within a common trailer
- j. All components explosion proof

The stripper system shall be housed within the common trailer, in accordance with process diagrams.

3. Control switches shall be installed to shut down the wastewater stripper if the following condition is met:
  - a. Water level in stripper sump drops to 1 inch above the floor drain.
  - b. Water pressure in the carbon units downstream rises to level set by the Wastewater System Operator.
  - c. Low air pressure in air stripper.



**E. Meters/Gauges.**

**All electrical meters and gauges shall be rated for use in Class I Division I areas.**

- 1. One pressure gauge (range 0 to 24-inches of water) shall be installed on the discharge side of the air stripper, and prior to the vapor carbon units; another pressure gauge (range 0 to 24-inches of water) shall be installed between the two vapor carbon units; and one pressure gauge (range 0 to 24-inches of water) shall be installed downstream of the final vapor phase carbon absorber unit.**
- 2. One temperature gauge (0 to 150°F) shall be installed on each of the vapor phase discharge pipes.**
- 3. One flow meter (magnetic or paddle wheel type, 0 to 150 g.p.m.) with totalizer and flow indicator shall be installed on the wastewater pump (P100A&B) discharge pipe to both the permanent and temporary wastewater treatment processes. A second flow meter and totalizer shall be installed downstream of the liquid phase absorbers. These flow meters shall include a digital totalizer. The totalizer shall be located at a convenient location for monitoring by on-site personnel.**
- 4. Pressure gauges (range 0 to 100 psi) shall be installed on the bag filters (BF-1 and BF-2 inlet side), and upstream of the secondary bag filter units (BF-3 and BF-4).**
- 5. One pressure gauge (range 0 to 50 psi) shall be installed on the discharge side of the air stripper sump pumps, and prior to the liquid carbon units; another pressure gauge (range 0 to 50 psi) shall be installed between the two liquid carbon units; and one pressure gauge (range 0 to 50 psi) shall be installed downstream of the final liquid phase carbon absorber unit.**

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. The Contractor shall be responsible for installing the systems at the site either within the Process Building at the location shown on Versar drawing # 3709-302 or secured adjacent to the Process Building. Pumps, piping and connection requirements for the wastewater storage system are provided in Specification Section 13050. Process and instrumentation requirements are indicated on Versar drawing # 3709-302. All instrumentation and manually controlled appurtenances shall be installed in locations easily accessible by on-site personnel.
- B. All piping and ductwork shall be clearly labeled with pipe markers clearly showing the following:
  - Pipe flow direction (with arrows),
  - Service/contents (liquid or vapor), and
  - Content name (3/4 inch all capital lettering, e.g., FEED WATER).

The pipe markers shall be color coded by Contractor, for quick identification, color coding to be approved by Versar.

### **3.02 SAMPLING AND ANALYSIS**

- A. Sampling and analysis of the effluent from the system shall be performed by the Contractor in accordance with Section 01392 - ENVIRONMENTAL SAMPLING AND QUALITY ASSURANCE and Section 13210 - SITE OPERATIONS AND MAINTENANCE. Sampling points shall be located as shown in the wastewater treatment system process drawings.

### **3.03 WASTE DISPOSAL**

- A. The Contractor shall be responsible for carbon acceptance testing and disposing and/or reactivation of spent carbon. Carbon shall be considered spent whenever breakthrough is detected from the lead treatment unit at the concentrations established during operations start-up.

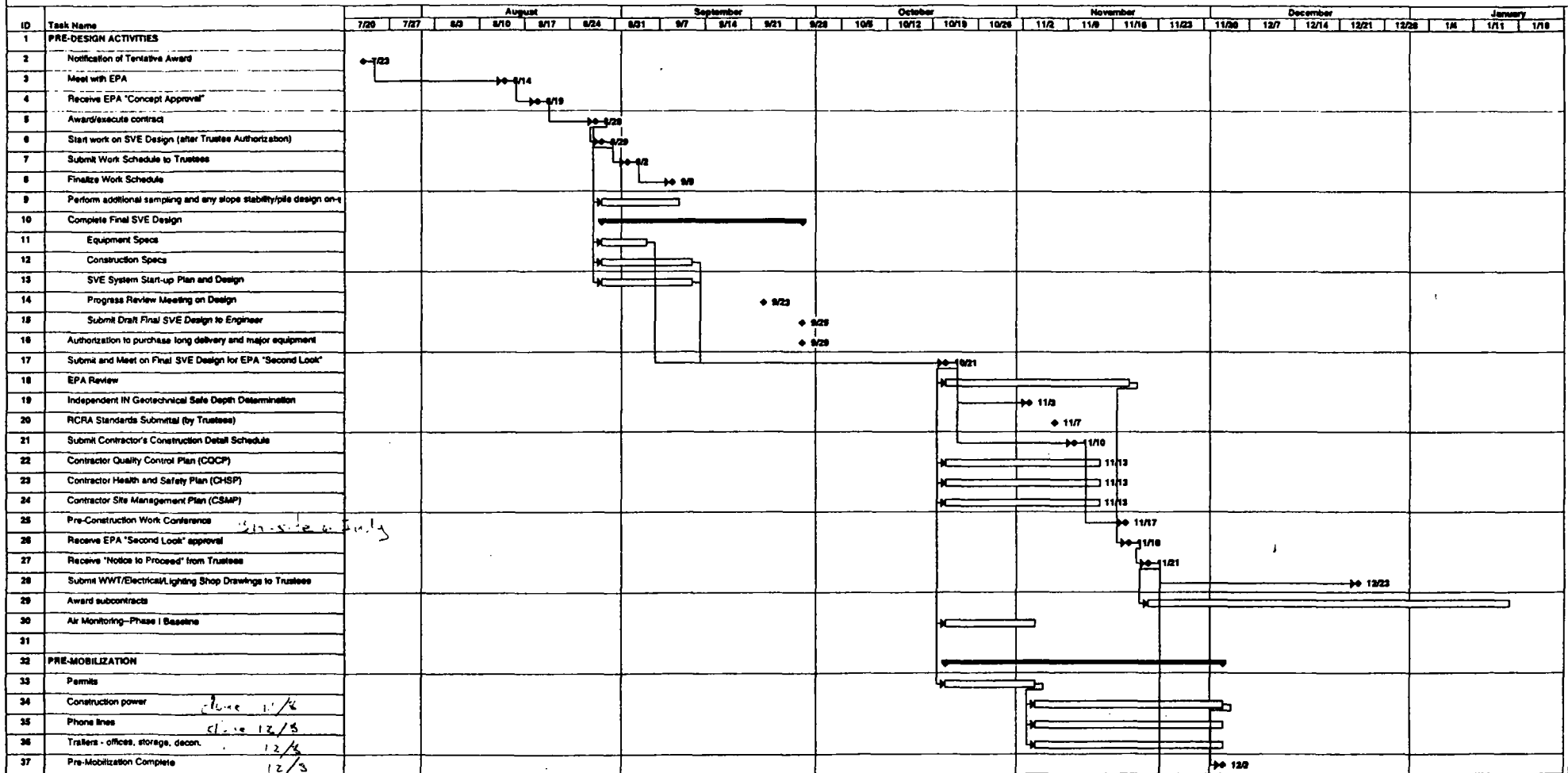
### **3.04 OPERATIONS**

- A. System start-up and operations are described in Specification Section 13210 - SITE OPERATIONS AND MAINTENANCE, Part 3.06.

END OF SECTION



**Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana  
RRA Project Schedule**



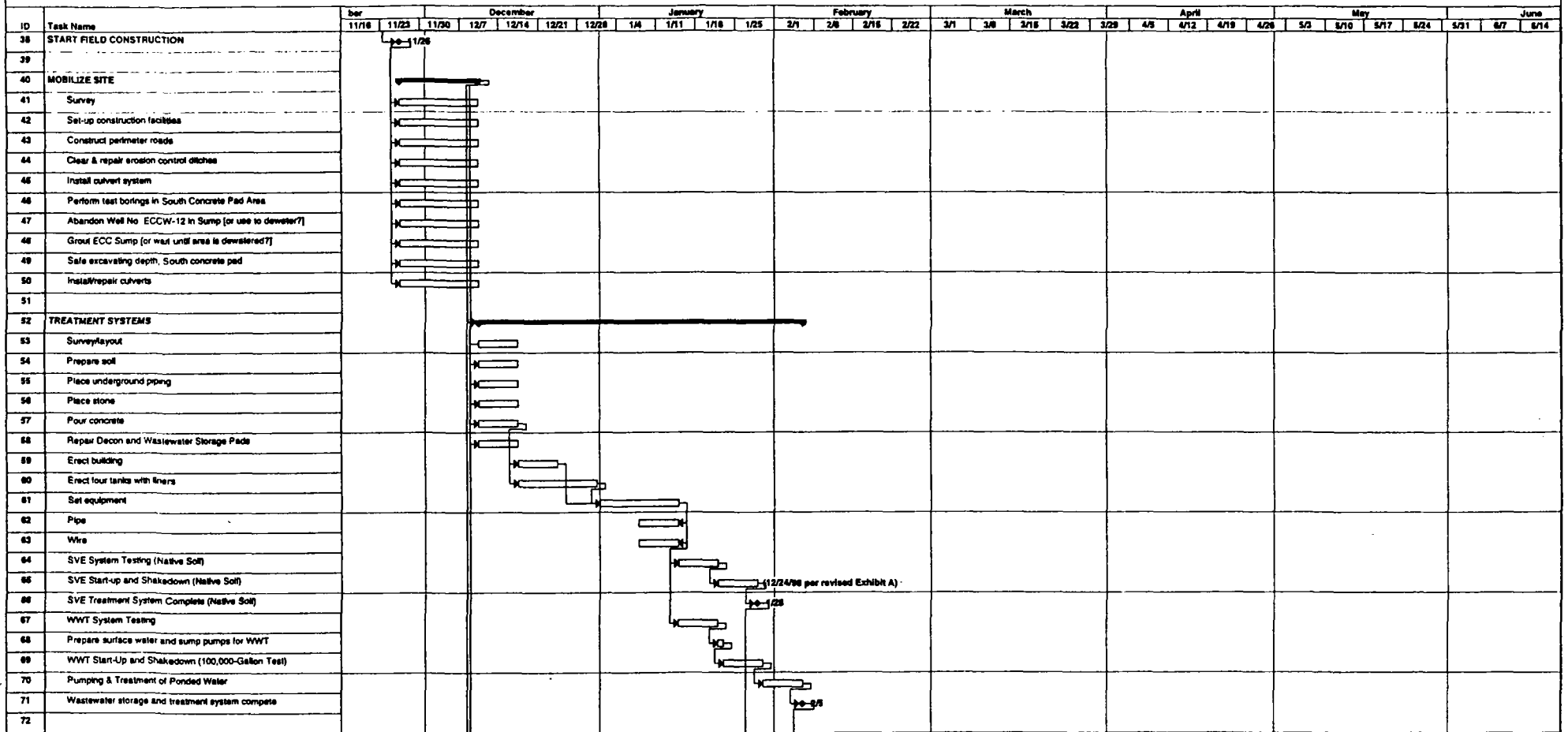
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Task Progress Milestone Summary

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**Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana  
RRA Project Schedule**



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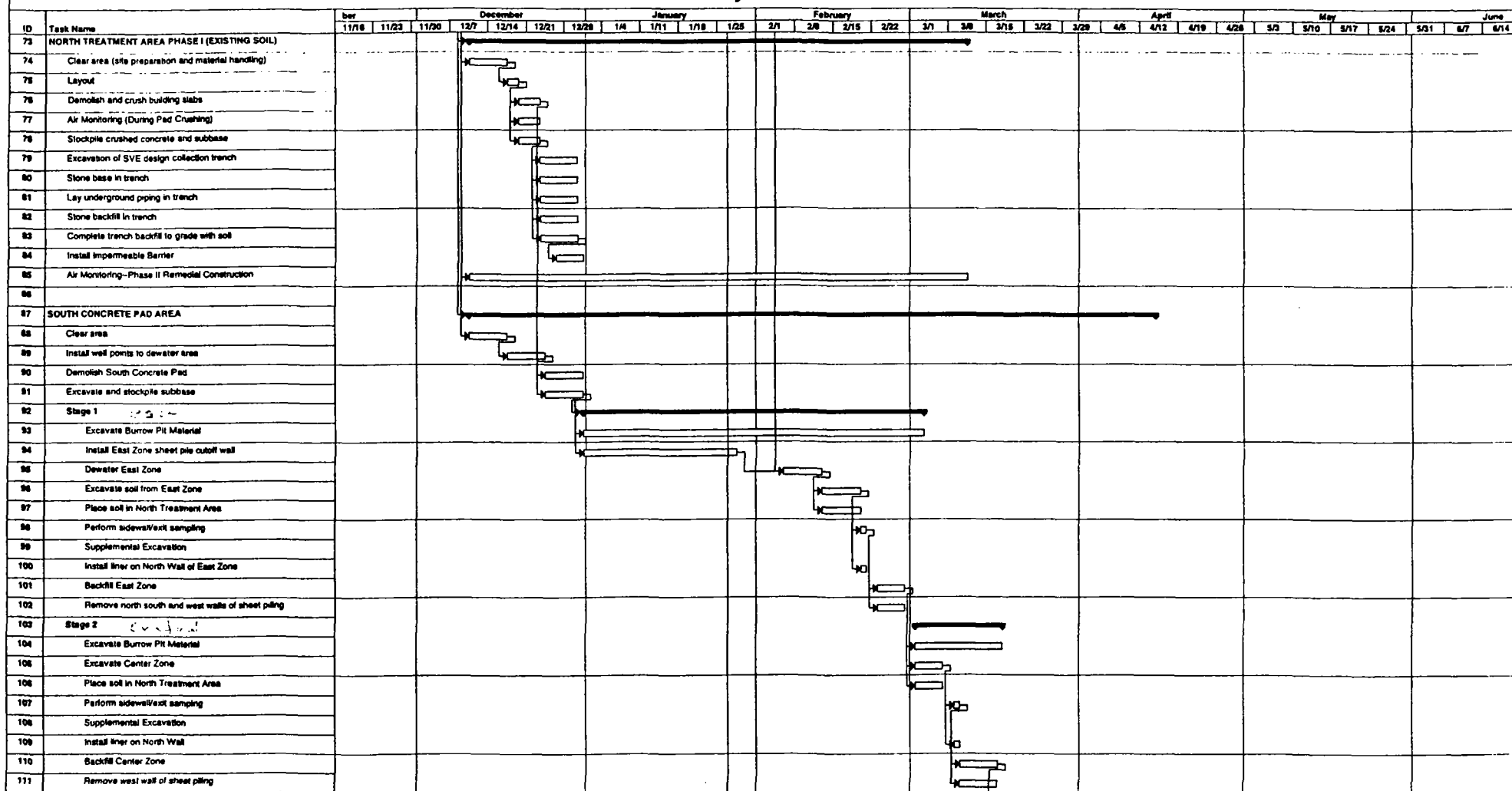
Task Progress Milestone Summary

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- 11/18/97 - 12/14/97 (will include Dec 22 or 23 or 24<sup>th</sup>)  
 - 12/14/97 - 1/11/98 (2 weeks)

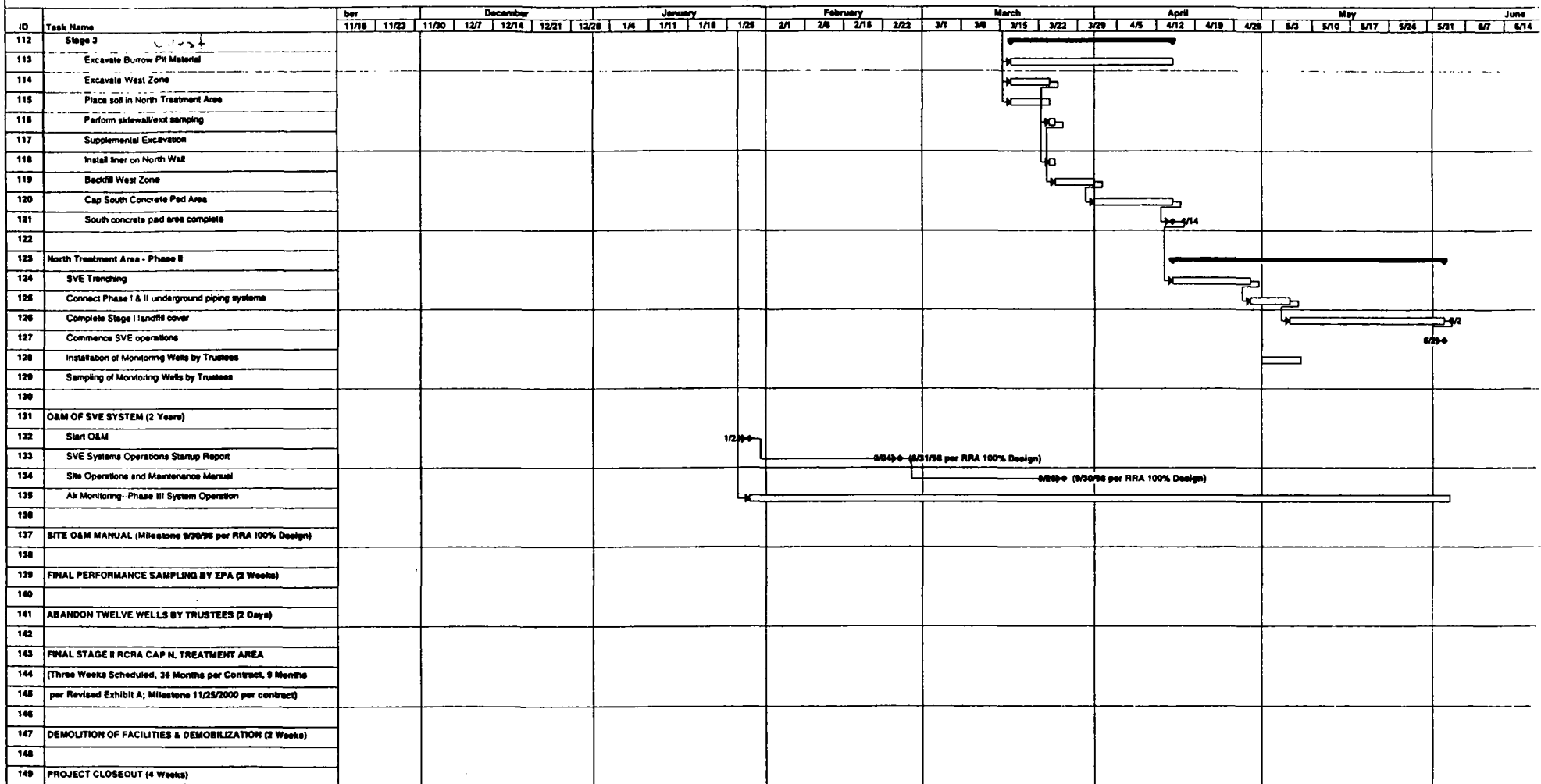
**Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana  
RRA Project Schedule**



Date: 10/15/97

Task Progress Milestone Summary

**Figure 1 - Enviro-Chem Superfund Site, Zionsville, Indiana  
RRA Project Schedule**



Date: 10/15/97

Task Progress Milestone Summary